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Aerospace Reports**

STAR

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Space Administration
Langley Research Center

**Scientific and Technical
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Scientific and Technical Aerospace Reports (STAR) is an electronic abstract journal, listing citations with abstracts for aerospace-related reports obtained from worldwide sources. It is electronically published biweekly and announces documents that have recently been entered into the NASA Scientific and Technical Information (STI) Database. The documents are of the following types:

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- Translations in report form;
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- Other U.S. Government agency and foreign patents and patent applications
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Also included are two indexes, Subject Term and Personal Author. The Subject Term Index is generated from the *NASA Thesaurus* terms associated and listed with each document.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

Abstracts in *STAR* are categorized by 10 major subject divisions that are divided further into 76 specific subject categories. The subject divisions and categories are listed in the Table of Contents together with a note for each that defines its scope and provides any cross-references.

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Subject Divisions

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Subject Categories of the Division A. Aeronautics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

- 01 Aeronautics (General) 1**
Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics see *categories 02 through 09*. For information related to space vehicles see *12 Astronautics*.
- 02 Aerodynamics 1**
Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery. For related information, see also *34 Fluid Mechanics and Heat Transfer*.
- 03 Air Transportation and Safety 3**
Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in *09 Research and Support Facilities (Air)*. Air traffic control is covered in *04 Aircraft Communications and Navigation*. For related information see also *16 Space Transportation and Safety*; and *85 Technology Utilization and Surface Transportation*.
- 04 Aircraft Communications and Navigation 4**
Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also *06 Avionics and Aircraft Instrumentation*; *17 Space Communications*; *Spacecraft Communications, Command and Tracking*, and *32 Communications and Radar*.
- 05 Aircraft Design, Testing and Performance 5**
Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*. For land transportation vehicles, see *85 Technology Utilization and Surface Transportation*.
- 06 Avionics and Aircraft Instrumentation 7**
Includes all avionics systems, cockpit and cabin display devices, and flight instruments intended for use in aircraft. For related information see also *04 Aircraft Communications and Navigation*; *08 Aircraft Stability and Control*; *19 Spacecraft Instrumentation and Astrionics*; and *35 Instrumentation and Photography*.
- 08 Aircraft Stability and Control 9**
Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also *05 Aircraft Design, Testing and Performance* and *06 Avionics and Aircraft Instrumentation*.

09 Research and Support Facilities (Air) 11

Includes airports, runways, hangers, and aircraft repair and overhaul facilities, wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operation see *03 Air Transportation and Safety*. For astronomical facilities see *14 Ground Support Systems and Facilities (Space)*.

Subject Categories of the Division B. Astronautics

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16 Space Transportation and Safety 11

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information, see also *03 Air Transportation and Safety* and *15 Launch Vehicles and Launch Operations*, and *18 Spacecraft Design, Testing and Performance*. For space suits, see *54 Man/System Technology and Life Support*.

18 Spacecraft Design, Testing and Performance 15

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems, see *54 Man/System Technology and Life Support*. For related information, see also *05 Aircraft Design, Testing and Performance*, *39 Structural Mechanics*, and *16 Space Transportation and Safety*.

20 Spacecraft Propulsion and Power 18

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also *07 Aircraft Propulsion and Power*; *28 Propellants and Fuels*; *15 Launch Vehicles and Launch Operations*; and *44 Energy Production and Conversion*.

Subject Categories of the Division C. Chemistry and Materials

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

23 Chemistry and Materials (General) 20

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see *categories 24 through 29*. For astrochemistry see category *90 Astrophysics*.

- 24 Composite Materials 21**
Includes physical, chemical, and mechanical properties of laminates and other composite materials.
- 25 Inorganic, Organic, and Physical Chemistry 23**
Includes the analysis, synthesis, and use inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see also *34 Fluid Dynamics and Thermodynamics*, *For astrochemistry see category 90 Astrophysics*.
- 26 Metals and Metallic Materials 25**
Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.
- 27 Nonmetallic Materials 26**
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see *24 Composite Materials*.
- 28 Propellants and Fuels 28**
Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power*, *20 Spacecraft Propulsion and Power*, and *44 Energy Production and Conversion*.
- 29 Space Processing 29**
Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see *84 Law, Political Science and Space Policy*.

Subject Categories of the Division D. Engineering

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

- 31 Engineering (General) 30**
Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see *categories 32 through 39*.
- 32 Communications and Radar 35**
Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also *04 Aircraft Communications and Navigation*; and *17 Space Communications, Spacecraft Communications, Command and*

Tracking; for search and rescue see 03 Air Transportation and Safety, and 16 Space Transportation and Safety.

33 Electronics and Electrical Engineering 37

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related information see also *60 Computer Operations and Hardware*; and *76 Solid-State Physics*. For communications equipment and devices see *32 Communications and Radar*.

34 Fluid Mechanics and Thermodynamics 40

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also *02 Aerodynamics*.

35 Instrumentation and Photography 42

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see *43 Earth Resources and Remote Sensing*. For related information see also *06 Avionics and Aircraft Instrumentation*; and *19 Spacecraft Instrumentation*.

37 Mechanical Engineering 44

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see *63 Cybernetics, Artificial Intelligence, and Robotics*; and *54 Man/System Technology and Life Support*.

38 Quality Assurance and Reliability 45

Includes approaches to, and methods for reliability analysis and control, inspection, maintainability, and standardization.

39 **Structural Mechanics** 45

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structure. For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

Subject Categories of the Division E. Geosciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

42 Geosciences (General) 46

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see *categories 42 through 48*.

- 43 Earth Resources and Remote Sensing 49**
Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis of remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see *35 Instrumentation and Photography*.
- 44 Energy Production and Conversion 51**
Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see *73 Nuclear Physics*. For related information see also *07 Aircraft Propulsion and Power*; *20 Spacecraft Propulsion and Power*, and *28 Propellants and Fuels*.
- 45 Environment Pollution 52**
Includes atmospheric, water, soil, noise, and thermal pollution.
- 46 Geophysics 59**
Includes earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see *47 Meteorology and Climatology*; and *93 Space Radiation*.
- 47 Meteorology and Climatology 61**
Includes weather observation forecasting and modification.
- 48 Oceanography 66**
Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics, and marine resources. For related information see also *43 Earth Resources and Remote Sensing*.

Subject Categories of the Division F. Life Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

- 51 Life Sciences (General) 66**
Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see *categories 52 through 55*.
- 52 Aerospace Medicine 67**
Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral

effects of aerospace environments see *53 Behavioral Sciences*. For the effects of space on animals and plants see *51 Life Sciences*.

54 Man/System Technology and Life Support 69

Includes human factors engineering; bionics, man-machine, life support, space suits and protective clothing. For related information see also *16 Space Transportation* and *52 Aerospace Medicine*..

55 Exobiology 71

Includes astrobiology, planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see *52 Aerospace medicine*; on animals and plants see *51 Life Sciences*. For psychological and behavioral effects of aerospace environments see *53 Behavioral Science*.

Subject Categories of the Division G. Mathematical and Computer Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

59 Mathematical and Computer Sciences (General) 72

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see *categories 60 through 67*.

60 Computer Operations and Hardware 73

Includes hardware for computer graphics, firmware and data processing. For components see *33 Electronics and Electrical Engineering*. For computer vision see *63 Cybernetics, Artificial Intelligence and Robotics*.

61 Computer Programming and Software 73

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

63 Cybernetics, Artificial Intelligence and Robotics 79

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also *54 Man/System Technology and Life Support*.

64 Numerical Analysis 79

Includes iteration, differential and difference equations, and numerical approximation.

65 **Statistics and Probability** 80

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

67	Theoretical Mathematics	81
	Includes algebra, functional analysis, geometry, topology set theory, group theory and and number theory.	

Subject Categories of the Division H. Physics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

70	Physics (General)	82
	Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see <i>categories 71 through 77</i> . For related instrumentation see <i>35 Instrumentation and Photography</i> ; for geophysics, astrophysics or solar physics see <i>46 Geophysics</i> , <i>90 Astrophysics</i> , or <i>92 Solar Physics</i> .	
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	Includes sound generation, transmission, and attenuation. For noise pollution see <i>45 Environment Pollution</i> . For aircraft noise see also <i>02 Aerodynamics</i> and <i>07 Aircraft Propulsion Propulsion and Power</i> .	
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	Includes nuclear particles; and reactor theory. For space radiation see <i>93 Space Radiation</i> . For atomic and molecular physics see <i>72 Atomic and Molecular Physics</i> . For elementary particle physics see <i>77 Physics of Elementary Particles and Fields</i> . For nuclear astrophysics see <i>90 Astrophysics</i> .	
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	Includes condensed matter physics, crystallography, and superconductivity. For related information see also <i>33 Electronics and Electrical Engineering</i> and <i>36 Lasers and Masers</i> .	

77 Physics of Elementary Particles and Fields 90

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also 72 *Atomic and Molecular Physics*, 73 *Nuclear Physics*, and 25 *Inorganic, Organic and Physical Chemistry*.

Subject Categories of the Division I. Social and Information Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

81 Administration and Management 91

Includes management planning and research.

82 Documentation and Information Science 93

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see *61 Computer Programming and Software*.

83 Economics and Cost Analysis 95

Includes cost effectiveness studies.

85 Technology Utilization and Surface Transportation 96

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see also *03 Air Transportation and Safety*, *16 Space Transportation and Safety*, and *44 Energy Production and Conversion*. For specific technology transfer applications see also the category where the subject is treated.

Subject Categories of the Division J. Space Sciences

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

89 Astronomy
96

Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

90 **Astrophysics** 97

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

- 91 Lunar and Planetary Science and Exploration 101**
- Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see *18 Spacecraft Design, Testing and Performance*.
- 92 Solar Physics 103**
- Includes solar activity, solar flares, solar radiation and sunspots. For related information see *93 Space Radiation*.
- 93 Space Radiation 104**
- Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see *52 Aerospace Medicine*. For theory see *73 Nuclear Physics*.

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Typical Report Citation and Abstract

- ❶ **19970001126** NASA Langley Research Center, Hampton, VA USA
- ❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼

To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

A Biweekly Publication of the National Aeronautics and Space Administration

VOLUME 39, SEPTEMBER 21, 2001

01

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Includes general research topics related to manned and unmanned aircraft and the problems of flight within the Earth's atmosphere. Also includes manufacturing, maintenance, and repair of aircraft. For specific topics in aeronautics see categories 02 through 09. For information related to space vehicles see 12 Astronautics.

20010079941 National Aerospace Lab., Tokyo Japan

Preliminary Stud of Thermal Protection System of Single-Stage-to Orbit Plane

Kudo, K.; Kando, T.; Dec. 2000; 18p; In Japanese; Portions of this document are not fully legible

Report No.(s): PB2001-106900; NAL-TR-1420; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

This paper discusses the thermal protection system (TPS) on an airframe of the Single Stage to Orbit (SSTO) with a scramjet engine. There is aerodynamic heating to the airframe during flight through the air, especially during hypersonic flight, and this paper examines ceramic tile insulation and hydrogen active cooling. The transient nature of each system was simulated along the ascent trajectory of the SSTO to the low earth orbit of 100 km. When ceramic tiling was used, a tile thickness of around 60 mm was required to protect the inside of the airframe. The highest temperature on the inside surface of the tile occurred after arrival to the orbit. The temperature on the inside surface increased with the decrease of the flight dynamic pressure. In the active cooling system, around 20% of fuel was used for airframe-cooling. Attaching thin ceramic tiling on the surface of the cooling panel reduced the cooling requirement.

NTIS

Airframes; Thermal Protection; Supersonic Combustion Ramjet Engines; Dynamic Pressure

02

AERODYNAMICS

Includes aerodynamics of flight vehicles, test bodies, airframe components and combinations, wings, and control surfaces. Also includes aerodynamics of rotors, stators, fans and other elements of turbomachinery. For related information, see also 34 Fluid Mechanics and Heat Transfer.

20010079114 Colorado State Univ., Dept. of Atmospheric Science, Fort Collins, CO USA

Operator's Manual for SHEBA Powered Tether Balloon System

Lappen, Cara-Lyn, Colorado State Univ., USA; Randall, David A., Colorado State Univ., USA; April 1998; 23p; In English

Contract(s)/Grant(s): NAG1-2081; NAG1-1701; NSF OPP-95-04246

Report No.(s): Atmospheric-Science-Paper-664; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Surface Heat and Energy Budget of the Arctic (SHEBA) was an intensive field project which took place in the Arctic Ocean from October 1997 through October 1998. Its purpose was to measure as many facets of the Arctic environment as possible so that we would be able to better understand the interaction between the ice, atmosphere, and ocean and their interactions with global climate. One aspect of the atmospheric field component was launching tethered balloons to monitor the profiles of temperature, wind, pressure, and humidity, as well as examine the vertical structure of cloud droplet sizes and distributions. The tethered balloon that we used was one specially designed for use in freezing climates by SPEC Corporation in Boulder, Colorado. A special winch that was able to withstand Arctic temperature and weather became necessary when the testing of simple winch systems used in warmer climates failed under these extreme conditions. The purpose of this manual is to acquaint any new user to the powered tethered balloon system deployed at the The Surface Heat and Energy Budget of the Arctic (SHEBA ice camp.

It includes a description of the preparations necessary to get ready for a launch, the mechanics of the actual launch, and an account of the proper procedure for taking down the equipment when finished. It will also include tips on how to minimize potential equipment failures, some trouble shooting, and some safety ideas. This manual is designed so that new operators can use the system with minimal previous training. At the end of this manual, the reader will find a quick checklist.

Author

Energy Budgets; Manuals; Tethered Balloons; Atmospheric Temperature; Arctic Regions; Climatology

20010079115 North Carolina State Univ., Dept. of Mechanical and Aerospace Engineering, Raleigh, NC USA

Research on Streamlines and Aerodynamic Heating for Unstructured Grids on High-Speed Vehicles, 1 Aug. 2000 - 30 Jun. 2001

DeJarnette, Fred R., North Carolina State Univ., USA; Aug. 21, 2001; 19p; In English

Contract(s)/Grant(s): NCC1-407; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Engineering codes are needed which can calculate convective heating rates accurately and expeditiously on the surfaces of high-speed vehicles. One code which has proven to meet these needs is the Langley Approximate Three-Dimensional Convective Heating (LATCH) code. It uses the axisymmetric analogue in an integral boundary-layer method to calculate laminar and turbulent heating rates along inviscid surface streamlines. It requires the solution of the inviscid flow field to provide the surface properties needed to calculate the streamlines and streamline metrics. The LATCH code has been used with inviscid codes which calculated the flow field on structured grids. Several more recent inviscid codes calculate flow field properties on unstructured grids. The present research develops a method to calculate inviscid surface streamlines, the streamline metrics, and heating rates using the properties calculated from inviscid flow fields on unstructured grids. Mr. Chris Riley, prior to his departure from NASA LaRC, developed a preliminary code in the C language, called "UNLATCH", to accomplish these goals. No publication was made on his research. The present research extends and improves on the code developed by Riley. Particular attention is devoted to the stagnation region, and the method is intended for programming in the FORTRAN 90 language.

Author

Unstructured Grids (Mathematics); Surface Properties; Aerodynamic Heat Transfer; Streamlining; C (Programming Language)

20010082522 Eloret Corp., Moffett Field, CA USA

Geometric Perturbations and Asymmetric vortex shedding About Slender Pointed Bodies

Murman, Scott M., Eloret Corp., USA; Jun. 06, 2000; 19p; In English

Contract(s)/Grant(s): RTOP 509-10-11; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The flow about slender, pointed bodies can be characterized by different states with angle of attack. At moderate-to-high angles of attack (α approximately equals 40deg), a steady, asymmetric vortex pattern develops along the body, leading to a net lateral force. At higher angles of attack (α approximately equals 60deg), the aft-end of the body develops an unsteady von Karman shedding. As the angle of attack approaches 90deg, the entire body length exhibits a time-dependent vortex shedding pattern. The current work uses three-dimensional, thin-layer Navier-Stokes simulations to investigate the physical mechanisms of asymmetric vortex shedding at $\alpha = 40\text{deg}$ and $\alpha = 60\text{deg}$. The development of an asymmetric vortex pattern via a convective instability mechanism is investigated using tip bumps, surface roughness, and tip curvature. It's found that surface roughness simulations can incite an asymmetric vortex state at $\alpha = 60\text{deg}$ which is consistent with the application of a tip bumps, and the experimentally observed flowfield. The unsteady von Karman vortex shedding on the aft portion of the body is also well resolved. The use of surface roughness did not incite a flow asymmetry at $\alpha = 40\text{deg}$, and it was necessary to simulate tip curvature at this angle of attack in order to generate an asymmetric vortex state.

Author

Perturbation; Surface Roughness; Vortex Shedding; Afterbodies; Slender Bodies; Flow Distribution

20010082960 NASA Ames Research Center, Moffett Field, CA USA

Aerothermodynamic Analysis of the Project FIRE II Afterbody Flow

Wright, Micheal J., Eloret Corp., USA; Loomis, Mark, NASA Ames Research Center, USA; [2000]; 4p; In English; 35th AIAA Thermodynamics Conference, 11-14 Jun. 2001, Anaheim, CA, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

35 years later, the Project FIRE II ballistic reentry to Earth at a nominal velocity of 11.4 km/s remains one of the best sources of heating data for the design of sample return capsules. The data from this flight experiment encompass both the thermochemical non-equilibrium and equilibrium flow regimes and include measurements of both radiative and total heating on the forebody and afterbody. Because of this, a number of researchers have performed computational fluid dynamics (CFD) simulations of the forebody of the FIRE II entry vehicle, with generally good results. In particular, Olynick et. al. coupled a Navier-Stokes solver

(GIANTS) with a radiation code (NOVAR) and showed excellent agreement in surface heat transfer over the FIRE II trajectory between 1634 and 1651 seconds (77 km to 37 km). However, in most cases the primary motivation of the previous work was to understand and model the coupling between shock layer radiation and aerothermodynamics, and thus the simulations concentrated on the forebody flow only. To our knowledge there have been no prior published attempts to reproduce the afterbody heating data. However, an understanding of this data is critical to our efforts to design the next generation of Earth and planetary entry vehicles and to assess our need for additional flight data.

Author

Aerothermodynamics; Afterbodies; Aerospace Vehicles; Flow Distribution; Computational Fluid Dynamics

03

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; aircraft ground operations; flight safety and hazards; and aircraft accidents. Systems and hardware specific to ground operations of aircraft and to airport construction are covered in 09 Research and Support Facilities (Air). Air traffic control is covered in 04 Aircraft Communications and Navigation. For related information see also 16 Space Transportation and Safety; and 85 Technology Utilization and Surface Transportation.

20010077972 National Transportation Safety Board, Washington, DC USA

Federal Family Assistance Plan for Aviation Disasters

Aug. 01, 2000; 52p; In English

Report No.(s): PB2001-107154; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This plan assigns responsibilities and describes the airline and Federal response to an aviation crash involving a significant number of passenger fatalities and/or injuries. It is the basic document for organizations which have been given responsibilities under this plan to develop supporting plans and establish procedures.

NTIS

Disasters; Aircraft Accidents; Injuries; Passengers

20010079698 Federal Aviation Administration, William J. Hughes Technical Center, Atlantic City, NJ USA

Video Landing Parameter Survey: Honolulu International Airport Final Report

Barnes, T.; DeFiore, T.; Micklos, R.; May 2001; 50p; In English

Contract(s)/Grant(s): DTFA03-94-Z-0029

Report No.(s): PB2001-106570; DOT/FAA/AR-00/72; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Federal Aviation Administration (FAA) William J. Hughes Technical Center is conducting a series of video landing parameter surveys at high-activity commercial airports to acquire a better understanding of typical landing contact conditions for a wide variety of aircraft and airports as they relate to current aircraft design criteria and practices. This is the third of a series of landing parameter surveys. This report documents the results from a survey at Honolulu International Airport (HNL) performed in April 1996. Previous surveys were conducted first at John F. Kennedy International Airport (JFK) in June 1994 and later at Washington National Airport (DCA) performed in June 1995. At HNL, four video cameras were temporarily installed along the south side of runway 8L. Video images of 332 heavy, wide-body transports were captured, analyzed, and the results presented herein. Landing parameters presented include sink rate; approach speed; touchdown pitch, roll, and yaw angles and rates; off-center distance; and the touchdown distance from the runway threshold. Wind and weather conditions were also recorded and landing weights were available for most landings. Since this program is only concerned with overall statistical usage information, all data were processed and are presented without regard to the airline or flight number.

NTIS

Aircraft Landing; Runway Alignment; Airports; Video Equipment

20010079699 Quadrant Engineering, Inc., Amherst, MA USA

Testing of Multifrequency Radar Algorithm for the Detection of Aircraft Icing Potential with Aircraft-Sampled Cloud and Precipitation Data

Pazmany, A. L.; Mead, J. B.; May 2001; 48p; In English

Report No.(s): PB2001-106552; DOT/FAA/AR-TN01/3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Quadrant Engineering, Inc. (QEI) has proposed a neural network algorithm for the estimation of cloud and precipitation parameters such as Liquid Water Content (LWC) and drop size from multifrequency radar measurements. QEI was subsequently commissioned to evaluate the performance of the technique with real, aircraft-sampled cloud and precipitation drop size

distributions. QEI simulated the radar signals of various frequencies using the aircraft-sampled drop size distributions, processed the radar signals with an artificial neural network, and compared the neural net estimated cloud and precipitation parameters with the actual parameters measured by the aircraft. Ice particles present in some of the sampled clouds and precipitation were not included in the analysis. Results indicate that a combination of 10-95 or 10-35-95 GHz radars can measure LWC with 1-km range resolution with a standard error of less than 0.05 g/m³ and drop size to within 50% error in high signal-to-noise-ratio conditions. The estimates of the 10-35 radar combination were not as accurate in similar conditions but are expected to be effective in long range, coarse resolution (>2 km) measurements.

NTIS

Radar Detection; Aircraft Icing; Ice Formation; Neural Nets; Algorithms

20010082521 Mitre Corp., Metrek Div., McLean, VA USA

Advanced Automation System Loads Analysis and Definition: Workload Analysis, Volume 2

Newman, L. C.; DeArmon, J. S.; O'Sullivan, D. F.; Aug. 1986; 266p; In English

Report No.(s): PB2001-100463; MTR-85W39-02; Copyright; Avail: Issuing Activity

The Advanced Automation System (AAS) is a proposed replacement for the hardware and software that function as the current real time air traffic control computer system. For purposes of system performance modeling, capacity management and system performance testing, a system workload is defined. This report, Volume II, describes the rationale for all workload parameter values. The workload parameters have values determined for the years 1985, 1995, 2000, and 2010. For the AAS time period, 1995 to 2010, the workload includes values for two AAS states, 'Prepare for Backup' and 'Handle Backup'. Facility-specific values are estimated for key workload parameters. A summary of workload parameter values for the AAS is presented in Volume I, 'Workload Definition.' In addition, the workload parameters are briefly defined.

NTIS

Automatic Control; Loads (Forces); Workloads (Psychophysiology); Systems Analysis; Air Traffic Control; Computer Programs; Management Systems

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes all modes of communication with and between aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 06 Avionics and Aircraft Instrumentation; 17 Space Communications; Spacecraft Communications, Command and Tracking, and 32 Communications and Radar.

20010077905 National Aerospace Lab., Flight Div., Tokyo, Japan

Development of Carrier-Phase and DGPS/INS Hybrid Navigation Algorithm

Harigae, M.; Murata, M.; Dec. 2000; 42p; In Japanese; Portions of this document are not fully legible

Report No.(s): PB2001-105887; NAL-TR-1416; Copyright; Avail: National Technical Information Service (NTIS)

To enable precision approach and landing navigation, a carrier-phase DGPS/INS hybrid navigation system was developed characterized by the primary use of a GPS carrier-phase rather than a GPS pseudorange. Half the advantages of this system are derived from installing a reliable INS able to provide 6-degrees of freedom navigation data with a wide dynamic range, and maintain high availability and continuity. The other advantages of the system come from the use of DGPS/INS hybrid navigation to improve navigation accuracy. In this DGPS/INS hybrid navigation algorithm, the authors used the Kalman filter, which estimates the carrier-phase ambiguity as well as INS drift errors. This system can then utilize the GPS carrier-phase, although the majority of conventional DGPS/INS systems are based on the GPS pseudorange. Because the GPS carrier-phase is tolerant to multipath errors, sub-meter positioning performance is achieved, while conventional DGPS/INS systems achieve accuracy over several meters.

NTIS

Global Positioning System; Hybrid Navigation Systems; Inertial Navigation; Landing Aids; Algorithms

20010082332 Ministry of Defence, Inst. of Military Technology, Budapest, Hungary

COTS in our Air Control System

Szekely, Bela, Ministry of Defence, Hungary; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 6-1 - 6-5; In English; See also 20010082326; Original contains color illustrations; Copyright Waived; Avail: CASI; A01, Hardcopy

A huge international project was launched in 1997 in Hungary: setting up an air control and sovereignty nationwide system based on former Soviet radars and American air sovereignty operations center (ASOC). The deadline was extremely short and the available funds low. The main strategy of the project was to use modular elements and commercial components as much as possible. That is why we decided using PC-s (dual Pentium II class), Windows NT 4.0 operating system and Visual C++ developer system. Some part of hardware were developed using digital signal processors (TEXAS type). Our specialists and American colleagues worked hard and the American-made ASOC center and the Hungarian information system were used for military service in the fourth quarter of 1998. The system transmitted the radar (military and civil, primer and secondary) information automatically to ASOC in real time.

Author

International Cooperation; Air Traffic Control; Sovereignty

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles, see 85 Technology Utilization and Surface Transportation.

20010080460 NASA Dryden Flight Research Center, Edwards, CA USA

A Monte Carlo Dispersion Analysis of the X-33 Simulation Software

Williams, Peggy S., NASA Dryden Flight Research Center, USA; [2001]; 11p; In English; AIAA Atmospheric Flight Mechanics Conference, 6-9 Aug. 2001, Montreal, Canada; Sponsored by American Inst. of Aeronautics and Astronautics, USA
Report No.(s): AIAA Paper 2001-4067; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A Monte Carlo dispersion analysis has been completed on the X-33 software simulation. The simulation is based on a preliminary version of the software and is primarily used in an effort to define and refine how a Monte Carlo dispersion analysis would have been done on the final flight-ready version of the software. This report gives an overview of the processes used in the implementation of the dispersions and describes the methods used to accomplish the Monte Carlo analysis. Selected results from 1000 Monte Carlo runs are presented with suggestions for improvements in future work.

Author

Computerized Simulation; Monte Carlo Method; Computer Programs; Software Development Tools; Dispersion

20010081749 NASA Langley Research Center, Hampton, VA USA

The Impact of Structural Vibration on Flying Qualities of a Supersonic Transport

Raney, David L., NASA Langley Research Center, USA; Jackson, E. Bruce, NASA Langley Research Center, USA; Buttrill, Carey S., NASA Langley Research Center, USA; Adams, William M., NASA Langley Research Center, USA; [2001]; 12p; In English; AIAA Atmospheric Flight Mechanics Conference, 6-9 Aug. 2001, Montreal, Canada; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2001-4006; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A piloted simulation experiment has been conducted in the NASA Langley Visual/Motion Simulator facility to address the impact of dynamic aeroelastic effects on flying qualities of a supersonic transport. The intent of this experiment was to determine the effectiveness of several measures that may be taken to reduce the impact of aircraft flexibility on piloting tasks. Potential solutions that were examined included structural stiffening, active vibration suppression, and elimination of visual cues associated with the elastic modes. A series of parametric configurations was evaluated by six test pilots for several types of maneuver tasks. During the investigation, several incidents were encountered in which cockpit vibrations due to elastic modes fed back into the control stick through involuntary motions of the pilot's upper body and arm. The phenomenon, referred to as biodynamic coupling, is evidenced by a resonant peak in the power spectrum of the pilot's stick inputs at a structural mode frequency. The results of the investigation indicate that structural stiffening and compensation of the visual display were of little benefit in alleviating the impact of elastic dynamics on the piloting tasks, while increased damping and elimination of control-effector excitation of the lowest frequency modes offered great improvements when applied in sufficient degree.

Author

Supersonic Transports; Flight Characteristics; Pilot Performance; Aeroelasticity; Structural Vibration; Control Equipment

20010082331 European Aeronautic Defence and Space Co., Munich, Germany

Consequences for the Design of Military Aircraft Systems Due to Integration of Commercial Electronic Components in Avionics

Cernko, E., European Aeronautic Defence and Space Co., Germany; Jaeger, D., European Aeronautic Defence and Space Co., Germany; Manser, R., European Aeronautic Defence and Space Co., Germany; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 5-1 - 5-10; In English; See also 20010082326; Original contains color illustrations; Copyright Waived; Avail: CASI; A02, Hardcopy

The time when aerospace requirements and investments initiated microelectronic components development has passed. Industries like Telecom and Personal Computer invest many times more than aerospace with huge economical, performance, size, mass, packaging, and assembly improvements. The lifespan of these developments in the market is very short. The Life Cycle Costs for keeping up avionics design with special ruggedised components and designs is likely to be higher than to adapt a military aircraft and their periphery to avionics with non-rugged electronic components. There are technical solutions available to adapt the military avionics environment to the requirements of nonrugged electronic components ad designs. This paper describes the relevant environmental aspects in nowadays military aircraft designs, which have to be considered and their relation to non-rugged electronics. Further on this paper describes some possible modifications of military aircraft designs to cope with the environmental requirements of non-rugged electronics.

Author

Microelectronics; Aircraft Design; Electronic Equipment

20010082364 NASA Langley Research Center, Hampton, VA USA

Airframe Design and Integration

Scotti, Stephen, NASA Langley Research Center, USA; ST Day 2000: Risk Reduction for The Next Generations; Oct. 03, 2000; 37p; In English; See also 20010082356; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The objectives of the project this viewgraph presentation summarizes include the following: (1) Decompose operational, safety, and cost requirements into a comprehensive and consistent set of design criteria for different structural and material concepts for Reusable Launch Vehicles (RLVs); (2) Develop compliance methods to ensure that different structural and material concepts are assessed at a consistent and adequate level of fidelity and safety; (3) Develop and assess weight reduction potential of integrated airframe concepts for RLVs, e.g., Thermal Protection System (TPS)/TPS Support/Cryogenic Tank System; (4) Compare performance and weight of various airframe structural and material concepts and structural arrangements and identify technology development needs; and (5) Develop high fidelity parametric models that include airframe structural interactions and major design drivers. The approaches taken to complete these objectives include the definition of vehicle requirements, airframe structural design requirements, load conditions, factors of safety, and integrated concepts.

Derived from text

Aircraft Design; Airframes; Design Analysis; Aerospace Safety

20010082369 NASA Langley Research Center, Hampton, VA USA

Integrated Design and Analysis Overview

Gates, Tom S., NASA Langley Research Center, USA; ST Day 2000: Risk Reduction for the Next Generations; Oct. 03, 2000; 28p; In English; See also 20010082356; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The objectives of the project this viewgraph presentation summarizes (integrated design and analysis) include the following: (1) Develop methodology for assessing the effects of manufacturing defects; (2) Develop damage tolerance criteria and damage tolerance database for reusable launch vehicle cryogenic tank structures, including impact, pressure leakage, cryogenic permeation, and validated damage prediction tools; and (3) Develop repair technology.

Derived from text

Cryogenic Fluid Storage; Spacecraft Maintenance; Reusable Launch Vehicles; Design Analysis

20010082370 NASA Langley Research Center, Hampton, VA USA

Integrated Thermal Structures and Materials Overview

Jensen, Brian, NASA Langley Research Center, USA; ST Day 2000: Risk Reduction for the Next Generations; Oct. 03, 2000; 18p; In English; See also 20010082356; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The accomplishments of the project this viewgraph presentation summarizes (integrated thermal structures and materials) include the following: (1) Langley Research Center prepared five resins with Tgs as high as 625 F, less than 1% volatiles, moderate toughness, and low melt viscosity and sent to Boeing or Lockheed Martin; (2) Glenn Research Center prepared four resins with Tgs as high as 700 F, less than 10% volatiles, and low melt viscosity and sent to Boeing; (3) Boeing successfully fabricated

2'x2'x36 ply composites by resin infusion of stitched preforms from all NASA supplied resins; and (4) Lockheed Martin successfully fabricated 13"x14"x16 ply composites by resin transfer molding from all NASA supplied resins.

Derived from text

Fabrication; Resins; Composite Materials

06

AVIONICS AND AIRCRAFT INSTRUMENTATION

Includes all stages of design of aircraft and aircraft structures and systems. Also includes aircraft testing, performance, and evaluation, and aircraft and flight simulation technology. For related information, see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles, see 85 Technology Utilization and Surface Transportation.

20010082339 Elektronik-System G.m.b.H., Fixed Wing Aircraft, Munich, Germany

Transitioning to Integrated Modular Avionics with a Mission Management System

Gangkofer, M., Elektronik-System G.m.b.H., Germany; Kader, H., Elektronik-System G.m.b.H., Germany; Kloeckner, W., Elektronik-System G.m.b.H., Germany; White, C. G., Elektronik-System G.m.b.H., Germany; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 15-1 - 15-12; In English; See also 20010082326; Copyright Waived; Avail: CASI; A03, Hardcopy

This paper presents an incremental approach towards the adoption of an Integrated Modular Avionics (IMA) architecture, via the implementation of a Mission Management System using present-day Commercial Off-the-Shelf (COTS) technology. While standardized IMA modules are planned to be developed in the medium term, the approach presented enables the maximum benefits to be obtained from those aspects of the IMA concepts which are the most advanced, while exploiting the availability of today's COTS hardware. This approach is embodied in the Mission Management System, which is under development at ESG. The paper first presents the approach adopted in transitioning towards the IMA architecture via the use of current-day COTS components. The Mission Management System is then described from the system architecture, software architecture, and hardware architecture points of view, noting the implementation constraints of current COTS components. The system characteristics which are achieved through the adoption of the relevant IMA principles together with open systems and COTS practices are presented. The mission management functions to be implemented on the system are defined, and an example is then presented of a complete avionics system built using the transitional technology of the Mission Management System in a number of Integrated Computers to provide a complete computing core. Some certification issues are discussed, and the adoption of an incremental certification approach is recommended. A path forward towards the development of a true IMA system implementation is proposed, including further development of the Mission Management System, and the migration to a modular implementation.

Derived from text

Architecture (Computers); Management Systems; Commercial Off-The-Shelf Products

20010082340 BAE Systems, Sensor Systems Div., Edinburgh UK

Avionics Architecture Standards as an Approach to Obsolescence Management

Jibb, D. J., BAE Systems, UK; Walker, J. B., BAE Systems, UK; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 16-1 - 16-12; In English; See also 20010082326; Copyright Waived; Avail: CASI; A03, Hardcopy

Obsolescence management techniques can be categorized as either production engineering based techniques that attempt to control an existing situation or design based approaches that attempt to minimize the initial problem. This paper addresses system architecture design as an approach to obsolescence management. The work of the ASAAC program in developing open architecture standards designed to exhibit a high level of obsolescence robustness is described. Other issues that relate to the financing and organization of obsolescence management are also discussed.

Author

Architecture (Computers); Management Methods; Technology Utilization; Military Technology

20010082342 European Aeronautic Defence and Space Co., Munich, Germany

Integrated Modular Avionics with COTS Directed to Open Systems and Obsolescence Management

Grabowski, G., European Aeronautic Defence and Space Co., Germany; Balser, B., European Aeronautic Defence and Space Co., Germany; Foerster, M., European Aeronautic Defence and Space Co., Germany; Strategies to Mitigate Obsolescence in Defense

Systems Using Commercial Components; June 2001, pp. 18-1 - 18-9; In English; See also 20010082326; Original contains color illustrations; Copyright Waived; Avail: CASI; A02, Hardcopy

This paper describes how to design open computer systems for mission critical applications within the avionics of military aircraft using 'Commercial Off The Shelf' (COTS) computer components. Design aspects of Integrated Modula Avionics (IMA) are incorporated. How these aspects contribute to an effective obsolescence management is also described. The content of this paper is presented within the context of projects currently running at the European Aeronautic Defence and Space (EADS) Deutschland GmbH, Military Aircraft Business Unit (MABU), which are dealing with the subjects of COTS and obsolescence. First the primary design aspects of open computer systems will be discussed as well as internationally recognized associations and standards dealing with this topic. The potential behind the use of open computer systems for future avionics of military aircraft is to be unveiled. It will be described how to set up open computer systems, considering IMA conform design aspects, which fulfill the requirements directed to the equipment of mission critical avionics in military aircraft. Within this context the core aspects of IMA will be introduced and compared to conventional systems. The use of COTS computer hardware (HW) and software (SW) will be presented as a cost effective solution for setting up open computer-systems for use in aircraft, until ASAAC conform HW and SW solutions are available. Possible COTS based configurations will be discussed referring to a current COTS computer system. This system is ruggedized for flight and built up with COTS HW and run by a COTS real time operating system. Successful flight-testing of the system has taken place. Due to the rapid developing IT technology, today's computer systems quickly face obsolescence. Avionics for military aircraft are especially vulnerable because of the long development cycles. The opportunities of managing obsolescence, given by the use of COTS computer HW and SW, are identified with respect to future avionics of military aircraft. Affected qualification and flight-clearance aspects as well as the porting of avionics SW applications, originally developed for proprietary computer systems, onto COTS computer systems will be mentioned.

Author

Avionics; Systems Management; Commercial Off-The-Shelf Products; Computer Programs

20010082343 Italian Air Force, Official Flight Test Centre, Rome, Italy

MB-339CD Aircraft Development COTS Integration in a Modern Avionics Architecture

Sabatini, R., Italian Air Force, Italy; Massari, M., Aermacchi S.p.A., Italy; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 19-1 - 19-9; In English; See also 20010082326; Original contains color illustrations; Copyright Waived; Avail: CASI; A02, Hardcopy

Obsolescence of electromechanical instruments and navigation sensors is one of the main reasons for new avionics development in military training aircraft upgrade programs. The growing requirements for advanced trainers in the role of lead-in-fighter aircraft push the development of integrated avionics system where cockpit displays, mission computer, solid-state navigation sensors, communication transceivers and flight data recorders are extensively employed. The use of COTS (Commercial Off The Shelf) solutions allows to mitigate components obsolescence and to meet the new operational requirements at an affordable cost with reasonable development risk. The purpose of this paper is to provide an overview of how these concepts have been applied in the development of an innovative, modular and reliable avionics system. The latest version of the proven MB-339 twin seat jet powered advanced trainer employs a modern state-of-the-art avionics architecture based on standard bus interface (i.e., MIL-STD-1553 and ARINC 429), capable to easily integrate COTS equipment. The system exhibits a full glass cockpit with three identical and interchangeable Multifunction Displays, Head-up Display and independent get-home instrumentation for back-up flight data presentation: all the cockpit displays use COTS active matrix full colour high resolution LCD's. COTS solutions are applied at hardware level in computer processing, interface and memory devices, providing state-of-the-art high performance digital technology solutions. Radio navigation equipment, air data computer and an embedded inertial-GPS platform are employed as proven, off-the-shelf and fully qualified military equipment. The paper highlights the advantages gained by the employment of COTS solutions in a modern, flexible, and expandable avionics architecture. In the paper, the equipment is deliberately described in general terms, omitting any manufacturer reference.

Author

Avionics; Commercial Off-The-Shelf Products; Technology Utilization

20010082349 European Aeronautic Defence and Space Co., Airborne Systems, Ulm Germany

A Consideration of Obsolescence within the Design of Modern Avionics Test Systems

Bach, Rainer, European Aeronautic Defence and Space Co., Germany; Mayer, Thomas, European Aeronautic Defence and Space Co., Germany; Charbonnier, Paul, European Aeronautic Defence and Space Co, France; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 25-1 - 25-8; In English; See also 20010082326; Original contains color illustrations; Copyright Waived; Avail: CASI; A02, Hardcopy

Considering obsolescence in avionics systems firstly leads to the obsolescence of the so called prime equipment. This means the equipment of which an avionics system is built. Normally the support equipment is more or less ignored or the analysis is postponed to a later date. We analyzed today's situation and differentiated our analysis in the (commercial off the shelf) market, customer requirements, and technology. During our analysis we decided to not only analyze the obsolescence situation within the test systems design, because obsolescence within the design of modern avionics test systems is only one of the determining factors. All factors have to be merged into a design concept inside of which single factors can't be considered stand alone. Our solution - covering the requirements of the end user of our systems - consists of a design concept covering the test systems critical interfaces, test system standards, and the philosophy of standardized units. This approach ensures the flexibility in hardware and software to adapt quickly as needed on the commercial market and to guarantee the long term support as needed on the military market. The approach is adaptable to various maintenance and service concepts providing each customer (nation) with its own In-Service concept supporting mobile and fixed service stations. We are convinced that our concept ultimately benefits to our customer without ignoring the interests of industry.

Author

Avionics; Standardization; Systems Management

08

AIRCRAFT STABILITY AND CONTROL

Includes flight dynamics, aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also 05 Aircraft Design, Testing and Performance and 06 Avionics and Aircraft Instrumentation.

20010080453 Old Dominion Univ., Norfolk, VA USA

Computational Investigation and Validation of Twin-Tail Buffet Response Including Dynamics and Control

Kandil, Osama A.; May 1998; In English

Contract(s)/Grant(s): NAG1-648; No Copyright; Avail: Issuing Activity; Abstract Only

Multidisciplinary tools for prediction of single rectangular-tail buffet are extended to single swept-back-tail buffet in transonic-speed flow, and multidisciplinary tools for prediction and control of twin-tail buffet are developed and presented. The configuration model consists of a sharp-edged delta wing with single or twin tails that are oriented normal to the wing surface. The tails are treated as cantilevered beams fixed at the root and allowed to oscillate in both bending and torsion. This complex multidisciplinary problem is solved sequentially using three sets of equations on a dynamic single or multi-block grid structure. The first set is the unsteady, compressible, Reynolds-averaged Navier-Stokes equations which are used for obtaining the flow field vector and the aerodynamic loads on the tails. The Navier-Stokes equations are solved accurately in time using the implicit, upwind, flux-difference splitting, finite volume scheme. The second set is the coupled bending and torsion aeroelastic equations of cantilevered beams which are used for obtaining the bending and torsion deflections of the tails. The aeroelastic equations are solved accurately in time using a fifth-order-accurate Runge-Kutta scheme. The third set is the grid-displacement equations and the rigid-body dynamics equations, which are used for updating the grid coordinates due to the tail deflections and rigid-body motions. The tail-buffet phenomenon is predicted for highly-swept, single vertical tail placed at the plane of geometric symmetry, and for highly-swept, vertical twin tails placed at three different spanwise separation distances. The investigation demonstrates the effects of structural inertial coupling and uncoupling of the bending and torsion modes of vibration, spanwise positions of the twin-tail, angle of attack, and pitching and rolling dynamic motions of the configuration model on the tail buffet loading and response. The fundamental issue of twin-tail buffet alleviation is addressed using two active flow-control methods. These methods are the tangential leading-edge blowing and the flow suction from the leading-edge vortex cores along their paths. Qualitative and quantitative comparisons with the available experimental data are presented. The comparisons indicate that the present multidisciplinary aeroelastic analysis tools are robust, accurate and efficient.

Author

Tail Assemblies; Aerodynamic Loads; Active Control; Buffeting; Dynamic Control; Flow Distribution; Leading Edges

20010080477 NASA Ames Research Center, Moffett Field, CA USA

Design of the Active Elevon Rotor for Low Vibration

Fulton, Mark V., NASA Ames Research Center, USA; [2000]; 1p; In English; AHS Aeromechanics Specialists' Meeting, 13-15 Nov. 2000, Atlanta, GA, USA; Sponsored by American Helicopter Society, Inc., USA; No Copyright; Avail: Issuing Activity; Abstract Only

Helicopter fuselages vibrate more than desired, and traditional solutions have limited effectiveness and can impose an appreciable weight penalty. Alternative methods of combating high vibration, including Higher Harmonic Control (HHC) via

harmonic swashplate motion and Individual Blade Control (IBC) via active pitch links, have been studied for several decades. HHC via an on-blade control surface was tested in 1977 on a full scale rotor using a secondary active swashplate and a mechanical control system. Recent smart material advances have prompted new research into the use of on-blade control concepts. Recent analytical studies have indicated that the use of on-blade control surfaces produces vibration reduction comparable to swashplate-based HHC but for less power. Furthermore, smart materials (such as piezoceramics) have been shown to provide sufficient control authority for preliminary rotor experiments. These experiments were initially performed at small scale for reduced tip speeds. More recent experiments have been conducted at or near full tip speeds, and a full-scale active rotor is under development by Boeing with Eurocopter et al. pursuing a similarly advanced full-scale implementation. The US Army Aeroflightdynamics Directorate has undertaken a new research program called the Active Elevon Rotor (AER) Focus Demo. This program includes the design, fabrication, and wind tunnel testing of a four-bladed, 12.96 ft diameter rotor with one or two on-blade elevons per blade. The rotor, which will be Mach scaled, will use 2-5/rev elevon motion for closed-loop control and will be tested in late 2001. The primary goal of the AER Focus Demo is the reduction of vibratory hub loads by 80% and the reduction of vibratory blade structural loads. A secondary goal is the reduction of rotor power. The third priority is the measurement and possible reduction of Blade Vortex Interaction (BVI) noise. The present study is focused on elevon effectiveness, that is, the elevon's ability to reduce all six components of the nonrotating 4/rev hub loads. Some design parameters have been kept fixed in this study, while others have been varied to determine their influence - on elevon effectiveness. The fixed parameters include all blade structural properties except for torsion stiffness; the varied parameters include torsion stiffness, elevon aerodynamic location, and the number and individual authority of elevon aerodynamic surfaces. This paper describes the preliminary design process being used for the AER, and describes and quantifies the emerging active rotor characteristics.

Derived from text

Design Analysis; Elevons; Rotor Aerodynamics; Vibratory Loads; Wind Tunnel Tests

20010081319 NASA Langley Research Center, Hampton, VA USA

Stability and Control Properties of an Aeroelastic Fixed Wing Micro Aerial Vehicle

Waszak, Martin R., NASA Langley Research Center, USA; Jenkins, Luther N., NASA Langley Research Center, USA; Ifju, Peter, Florida Univ., USA; [2001]; 12p; In English; AIAA Atmospheric Flight Mechanics Conference, 6-9 Aug. 2001, Montreal, Canada; Sponsored by American Inst. of Aeronautics and Astronautics, USA; Original contains color illustrations
Report No.(s): AIAA Paper 2001-4005; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Micro aerial vehicles have been the subject of considerable interest and development over the last several years. The majority of current vehicle concepts rely on rigid fixed wings or rotors. An alternate design based on an aeroelastic membrane wing concept has also been developed that has exhibited desired characteristics in flight test demonstrations and competition. This paper presents results from a wind tunnel investigation that sought to quantify stability and control properties for a family of vehicles using the aeroelastic design. The results indicate that the membrane wing does exhibit potential benefits that could be exploited to enhance the design of future flight vehicles.

Author

Aeroelasticity; Research Vehicles; Flight Tests; Stability; Flight Control

20010081320 NASA Dryden Flight Research Center, Edwards, CA USA

Reconfigurable Control Design for the Full X-33 Flight Envelope

Cotting, M. Christopher, NASA Dryden Flight Research Center, USA; Burken, John J., NASA Dryden Flight Research Center, USA; August 2001; 16p; In English; AIAA Guidance, Navigation and Control Conference, 6-10 Aug. 2001, Montreal, Quebec, Canada; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 715-33-02-E8-23

Report No.(s): NASA/TM-2001-210396; H-2458; NAS 1.15:210396; AIAA Paper 2001-4379; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A reconfigurable control law for the full X-33 flight envelope has been designed to accommodate a failed control surface and redistribute the control effort among the remaining working surfaces to retain satisfactory stability and performance. An offline nonlinear constrained optimization approach has been used for the X-33 reconfigurable control design method. Using a nonlinear, six-degree-of-freedom simulation, three example failures are evaluated: ascent with a left body flap jammed at maximum deflection; entry with a right inboard elevon jammed at maximum deflection; and landing with a left rudder jammed at maximum deflection. Failure detection and identification are accomplished in the actuator controller. Failure response comparisons between the nominal control mixer and the reconfigurable control subsystem (mixer) show the benefits of reconfiguration. Single aerosurface jamming failures are considered. The cases evaluated are representative of the study conducted to prove the adequate

and safe performance of the reconfigurable control mixer throughout the full flight envelope. The X-33 flight control system incorporates reconfigurable flight control in the existing baseline system.

Author

X-33 Reusable Launch Vehicle; Configuration Management; Control Systems Design; Flight Envelopes; Flight Control; Control Theory

09

RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, runways, hangars, and aircraft repair and overhaul facilities; wind tunnels, water tunnels, and shock tubes; flight simulators; and aircraft engine test stands. Also includes airport ground equipment and systems. For airport ground operations see 03 Air Transportation and Safety. For astronautical facilities see 14 Ground Support Systems and Facilities (Space).

20010079701 National Aerospace Lab., Tokyo Japan

Spectroscopic Analysis of NO Band Emissions from Arc-Heated Air Flows in a 750kW Arc-Heated Wind Tunnel

Watanabe, Y.; Ishida, K.; Shirai, H.; Dec. 2000; 20p; In Japanese; Portions of this document are not fully legible

Report No.(s): PB2001-106902; NAL-TR-1417; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Spectroscopic measurements of arc-heated high enthalpy air free streams were carried out in a 750 kW arc-heated wind tunnel. A 50cm Acton SpectraPro 500iu spectrograph with Princeton Instrument 576G-1 ICCD detector was used to obtain emission spectra in the wavelength range from 190nm to 900nm. Major spectral features identified were the vibrational of NO gamma delta and epsilon band systems in the UV region. All the vibrational bands observed show only an upper vibrational level of $v'=0$. The NO bands were analyzed and synthetic spectra built based on the detailed energy level structure of NO and spectral line profile. The extent of agreement between synthetic and high resolution experimental spectra was examined to determine rotational temperatures, using a spectral profile matching method. Vibrational temperatures could not be determined by experiment due to the lack vibrational bands with v' greater than 0. Examining problems such as the lack of Beta band system and v' greater than 0 bands of other band systems and, unexpectedly weak intensities of the E band systems would be of use in clarifying details of nonequilibrium energy transfer mechanisms in the flow.

NTIS

Wind Tunnel Tests; Nitrogen Oxides; Emission Spectra; Gas Detectors

16

SPACE TRANSPORTATION AND SAFETY

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. For related information, see also 03 Air Transportation and Safety and 15 Launch Vehicles and Launch Vehicles, and 18 Spacecraft Design, Testing and Performance. For space suits, see 54 Man/System Technology and Life Support.

20010077940 NASA Johnson Space Center, Houston, TX USA

STS-105 Flight Day 11 Highlights

Aug. 21, 2001; In English; Videotape: 29 min. 30 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001130665; BRF-1430K; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

On this 11th day of the STS-105 mission, the three crews, Expedition 2 (Commander Yuriy Usachev and Flight Engineers James Voss and Susan Helms), Expedition 3 (Frank Culbertson, Jr., Mikhail Turin, and Vladimir Dezhurov), and STS-105 (Commander Scott Horowitz, Pilot Fred Sturckow, and Mission Specialists Dan Barry and Pat Forrester), gather to say a few words about the changeover of the control of the International Space Station (ISS). Footage shows the undocking of Discovery from the ISS. STS-105 and E2 crews answer questions about the stay on the ISS in an on-orbit interview.

CASI

International Space Station; Spacecrews; Spacecraft Docking; Crew Procedures (Inflight)

20010077947 NASA Johnson Space Center, Houston, TX USA

STS-105 Flight Day 10 Highlights

Aug. 19, 2001; In English; Videotape: 30 min. 11 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001130666; BRF-1430J; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

On this tenth day of the STS-105 mission, footage shows the Leonardo Multipurpose Logistics Module packed and ready to return to Earth before it is grappled using the robotic arm and returned to the payload bay of Discovery. As the orbiter and the International Space Station fly over Earth, Florida is seen, as are Washington and Oregon (where the forest fires blaze), Lake Winnipeg, and the border between Ontario and Quebec.

CASI

International Space Station; Space Station Modules; Crew Procedures (Inflight)

20010077948 NASA Johnson Space Center, Houston, TX USA

STS-105 Flight Day 12 Highlights

Aug. 22, 2001; In English; Videotape: 20 min. 38 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001130664; BRF-1430L; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

In this 12th day of the STS-105 mission, Discovery continues to fly towards Earth after the previous day's undocking from the International Space Station (ISS). Several on-orbit interviews are conducted, including questions to the STS-105 crew (Commander Scott Horowitz, Pilot Fred Sturckow, and Mission Specialists Dan Barry and Pat Forrester) about spaceflight, questions to the Expedition 2 crew (Commander Yuriy Usachev and Flight Engineers James Voss and Susan Helms) about their stay on the ISS, and questions to the Expedition 3 crew (Frank Culbertson, Jr., Mikhail Turin, and Vladimir Dezhurov) about some of the experiments on board the ISS. Typhoon 14 is seen from above as Discovery passes over the storm.

CASI

International Space Station; Space Flight; Spacecrews; Crew Procedures (Inflight)

20010080461 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-105 Countdown Status Briefing

Aug. 06, 2001; In English; Videotape: 20 min. 39 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001133694; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

Joel Wells, NASA Public Affairs, introduces Steve Altemus, NASA Test Director, Glenn Chin, STS-105 Mission Manager, and Ed Priselac, Shuttle Weather Officer, in this STS-105 prelaunch press conference. An overview is given of the launch countdown, payload status (Leonardo Multipurpose Logistics Module), and weather forecast. The men then answer questions from the press.

CASI

Countdown; Payloads; Weather Forecasting; Prelaunch Summaries

20010080462 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-105 Pre-Launch Press Conference

Aug. 07, 2001; In English; Videotape: 28 min. 53 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001133691; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

George Diller, NASA Public Affairs, introduces Bill Gerstenmaier, Deputy Manager of the ISS Program, Dave King, NASA Director of Shuttle Processing, and Judy Konecky, Staff Meteorologist, in this STS-105 press conference. An overview is given of the success of the Expedition 2 crew, the expectations of the Expedition 3 crew, the launch countdown status, and the weather forecast for the Shuttle launch. They then answer questions from the press.

CASI

Countdown; Weather Forecasting; Prelaunch Summaries; Astronaut Performance

20010080463 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-104 Pre-Launch Press Conference

Jul. 10, 2001; In English; Videotape: 35 min. 55 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001133690; No Copyright; Avail: CASI; B03, Videotape-Beta; V03, Videotape-VHS

George Diller, NASA Public Affairs, introduces Jim Halsell, Shuttle Program Launch Integration Manager, Dave King, NASA Director of Shuttle Processing, Michael Hawes, Deputy Associate Administrator for ISS, and John Weems, Launch

Weather Officer, in this STS-104 press conference. An overview is given of the launch and mission activities, International Space Station activities during the mission, and the weather forecast for the launch. The men then answer questions from the press.

CASI

Weather Forecasting; Prelaunch Summaries

20010080464 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-104 Countdown Status Briefing

Jul. 10, 2001; In English; Videotape: 15 min. 22 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001133689; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

George Diller, NASA Public Affairs, introduces Pete Nickolenko, NASA Test Director, Scott Higginbotham, STS-104 Mission Manager, and Ed Priselac, Shuttle Weather Officer, in this STS-104 launch minus two days press conference. An overview is given of the launch vehicle status, countdown procedures, payload status, and weather forecast. The men then answer questions from the press.

CASI

Countdown; Launch Vehicles; Weather Forecasting; Prelaunch Summaries

20010080465 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-104 Flight Crew Post-Landing Press Conference

Jul. 25, 2001; In English; Videotape: 19 min. 28 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001133688; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

Joel Wells, NASA Public Affairs, introduces the STS-104 crew, Commander Steven Lindsey, Pilot Charles Hobaugh, and Mission Specialists Mike Gernhardt, Jim Reilly, and Janet Kavandi, in this post-landing press conference. Commander Lindsey makes a brief statement about the mission and each crewmember's role in the activities. The crew then answers questions from the press.

CASI

Spacecrews; Postflight Analysis; Astronaut Performance

20010080466 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-104 Countdown Status Briefing

Jul. 11, 2001; In English; Videotape: 10 min. 50 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001133687; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

George Diller, NASA Public Affairs, introduces Jeff Spaulding, NASA Test Director, Louie Garcia, STS-104 Operations Engineer, and Ed Priselac, Shuttle Weather Officer, in this launch minus one day press conference. An overview is given of the launch vehicle status, countdown procedures, payload status, and weather forecast. The men then answer questions from the press.

CASI

Countdown; Launch Vehicles; Weather Forecasting; Prelaunch Summaries

20010080470 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-104 Countdown Status Briefing

Jul. 09, 2001; In English; Videotape: 25 min. 51 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001133693; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

Joel Wells, NASA Public Affairs, introduces Jeff Spaulding, NASA Test Director, Gregory Horvath, STS-104 Mission Integration Engineer, and Ed Priselac, Shuttle Weather Officer, in this STS-104 prelaunch press conference. An overview is given of the launch countdown, payload status, and weather forecast. The men then answer questions from the press.

CASI

Countdown; Payloads; Weather Forecasting; Prelaunch Summaries

20010080471 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-105 Countdown Status Briefing

Aug. 08, 2001; In English; Videotape: 13 min. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001133692; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

Bruce Buckingham, NASA Public Affairs, introduces Steve Altemus, NASA Test Director, and Glenn Chin, STS-105 Mission Manager, in this STS-105 prelaunch press conference. An overview is given of the launch countdown, payload status, and weather forecast. The men then answer questions from the press.

CASI

Countdown; Payloads; Weather Forecasting; Prelaunch Summaries

20010081597 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-104 Post-Launch News Conference

Jul. 12, 2001; In English; Videotape: 5 min. 58 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001133695; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

George Diller, NASA Public Affairs, introduces Jim Halsell, Director of Shuttle Launch Integration, and Mike Leinbach, Shuttle Launch Director, in this STS-104 post-launch press conference. The men give an overview of the successful launch of Atlantis and answer questions from the press.

CASI

Spacecraft Launching; Postlaunch Reports

20010082356 NASA Marshall Space Flight Center, Huntsville, AL USA

ST Day 2000: Risk Reduction for the Next Generations

Oct. 03, 2000; 236p; In English; Space Transportation Technology Workshop, 11-12 Oct. 2000, Huntsville, AL, USA; See also 20010082357 through 20010082370; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

The goal of in-space transportation technology is to achieve within 15 years a factor of ten reduction in the cost of Earth orbital transportation and a factor of two to three reduction in propulsion system mass and travel time required for planetary missions and within 25 years to enable bold new missions to the edge of the solar system and beyond by reducing travel times by one to two orders of magnitude.

Derived from text

Space Missions; Space Transportation; Spacecraft Propulsion

20010082359 NASA Langley Research Center, Hampton, VA USA

Integrated Airframe Demonstrations

Glass, David E., NASA Langley Research Center, USA; Sawyer, J. Wayne, NASA Langley Research Center, USA; ST Day 2000: Risk Reduction for The Next Generations; Oct. 03, 2000; 9p; In English; See also 20010082356; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The objective of the project described in this viewgraph presentation is to develop and verify the technology required for the application of minimal weight control surfaces that meet MASP vehicle requirements. The approaches include the development of design and fabrication concepts, the verification of concept design through sub-component fabrication and tests, the design and fabrication of a full-scale segment of the carbon-carbon control surface, and the design verification and fabrication technology by thermal and structural tests.

Derived from text

Airframes; Control Surfaces; Fabrication; Carbon-Carbon Composites

20010082362 NASA Langley Research Center, Hampton, VA USA

FY 2001 and Beyond Program Plan

Bowles, Dave, NASA Langley Research Center, USA; ST Day 2000: Risk Reduction for The Next Generations; Oct. 03, 2000; 19p; In English; See also 20010082356; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The scope of the project summarized in this viewgraph presentation is to develop and demonstrate third generation airframe technologies that provide significant reductions in cost of space transportation systems while dramatically improving the safety and higher operability of those systems. The Earth-to-orbit goal is to conduct research and technology development and demonstrations which will enable US industry to increase safety by four orders of magnitude (loss of vehicle/crew probability less than 1 in 1,000,000 missions) and reduce costs by two orders of magnitude within 25 years.

Derived from text

Airframes; Project Planning; Aerospace Safety; Research and Development

20010082365 NASA Marshall Space Flight Center, Huntsville, AL USA

GTX Project Summary

ST Day 2000: Risk Reduction for The Next Generations; Oct. 03, 2000; 26p; In English; See also 20010082356; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The objectives of the GTX (Vertical Take-off/ Horizontal Landing reusable single-stage-to-orbit system) project this viewgraph presentation summarizes include the following: (1) Determine whether or not air-breathing propulsion can enable reusable single stage to orbit vehicles; (2) Provide validated system performance data, and a baseline system design; and (3) Develop technologies applicable to high-speed airbreathing propulsion

Derived from text

Air Breathing Engines; Spacecraft Propulsion; Single Stage to Orbit Vehicles

20010082529 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-105 Post-Landing Crew Press Conference

Aug. 22, 2001; In English; Videotape: 13 min. 47 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001137225; No Copyright; Avail: CASI; B01, Videotape-Beta; V01, Videotape-VHS

Bruce Buckingham, NASA Public Affairs, introduces STS-105 Commander Scott Horowitz and Mission Specialists Dan Barry, who each make a brief statement about the mission. They then answer questions from the press.

CASI

Spacecrews; Postflight Analysis

20010082535 NASA Kennedy Space Center, Cocoa Beach, FL USA

STS-105 Post-Launch Press Conference

Aug. 09, 2001; In English; Videotape: 16 min. 36 sec. playing time, in color, with sound

Report No.(s): NONP-NASA-VT-2001137227; No Copyright; Avail: CASI; B02, Videotape-Beta; V02, Videotape-VHS

Lisa Malone, NASA Public Affairs, introduces Jim Halsell, Shuttle Program Launch Integration Manager, and Mike Leinbach, Shuttle Launch Director, who give an overview of the successful launch of the STS-105 Discovery Orbiter. The men then answer questions from the press.

CASI

Spacecraft Launching; Postlaunch Reports

18

SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and spacecraft control and stability characteristics. For life support systems, see 54 Man/System Technology and Life Support. For related information, see also 05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation and Safety.

20010077817 NASA Glenn Research Center, Cleveland, OH USA

Goals, History and Current Programs of Workshop

Space Mechanisms Technology Workshop; June 2001, pp. 10-29; In English; See also 20010077815; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Mr. Robert Fusaro, coordinator for the Glenn Research Center Space Mechanisms program, presented the goals of the workshop, history of previous workshops and gave an overview of current space mechanisms work performed by Glenn Research Center. Highlights of his presentation are shown. Following the presentation, Mr. Fusaro demonstrated the new NASA Space Mechanisms Handbook and Reference Guide CD ROM, which was featured as a highlight of the workshop. The handbook is an authoritative guide for design and testing of space mechanisms and related components. Over 600 pages of guidelines written by 25 experts in the field provide in-depth information on how to design space mechanisms and components, including: deployables, release devices, latches, rotating and pointing mechanisms, dampers, motors, gears, fasteners, valves, etc. The handbook provides details on appropriate environmental and tribological testing methods and practices required to evaluate new mechanisms and components. Distribution of the Handbook and Reference Guide is limited by ITAR (International Traffic in Arms Regulations).

It is available only to US companies and citizens. A request form for the CD ROM can be found on the Space Mechanisms Project website at <http://www.grc.nasa.gov/WWW/spacemech/>.

Derived from text

Mechanical Drives; Aerospace Engineering; Aerospace Industry; Handbooks; Tribology

20010077818 NASA Glenn Research Center, Cleveland, OH USA

Movable Lander for Manned Mars Mission

Space Mechanisms Technology Workshop; June 2001, pp. 30-34; In English; See also 20010077815; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In the second half of the workshop, participants split into three groups to develop a consensus on the following questions: (1) What are the current space drive resources and issues? (2) What are the future space drive technology needs and issues? and (3) Should we hold regular workshops on space mechanisms and space drives? The three groups considered these questions from the perspective of researchers working in (1) manned spacecraft; (2) unmanned spacecraft; and (3) planetary surface exploration vehicles.

Derived from text

Aerospace Engineering; Manned Mars Missions; Mechanical Drives; Mars Surface

20010077906 National Aerospace Lab., Structures Div., Tokyo, Japan

Study on the SELENE Model-Following Control System Using the Flying Test Bed

Hamada, Y.; Ninomiya, T.; Yamaguchi, I.; Sasa, S.; Itagaki, H.; Dec. 2000; 19p; In Japanese; Portions of this document are not fully legible

Report No.(s): PB2001-105886; NAL-TR-1418; Copyright; Avail: National Technical Information Service (NTIS)

The SELENE (SELEnological and Engineering Explorer) mission is scheduled for launch in 2003 and will make a soft-landing on the lunar surface in 2004, a year after reaching an orbit around the moon. The flying test bed (FTB) was developed for preliminary terrestrial landing experiments, and the first flight experiment completed at the end of FY 1999. The aim of this experiment was validation of the FTB flight system as a whole. Other experiments are planned to validate the effectiveness of SELENE onboard hardware, such as sensor systems, and softwares for control systems. In order to test these systems, the FTB should have the same dynamic characteristics as the SELENE. In this paper the authors are concerned with the controller of the FTB, which enables the FTB to follow the SELENE model. Some simulations are provided to show the effectiveness of the proposed system to follow the SELENE model. A dynamical closed loop test designed to validate the SELENE onboard attitude and orbit control system is also simulated using this system.

NTIS

Space Missions; Attitude Control; Controllers; Dynamic Characteristics; Feedback Control

20010078915 NASA Marshall Space Flight Center, Huntsville, AL USA

Simulation of the Effect of Realistic Space Vehicle Environments on Binary Metal Alloys

Westra, Douglas G., NASA Marshall Space Flight Center, USA; Poirier, D. R., NASA Marshall Space Flight Center, USA; Heinrich, J. C., NASA Marshall Space Flight Center, USA; Sung, P. K., NASA Marshall Space Flight Center, USA; Felicelli, S. D., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 2nd Pan-Pacific Basin Workshop on Microgravity Sciences 2001, 1-4 May 2001, Pasadena, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Simulations that assess the effect of space vehicle acceleration environments on the solidification of Pb-Sb alloys are reported. Space microgravity missions are designed to provide a near zero-g acceleration environment for various types of scientific experiments. Realistically, these space missions cannot provide a perfect environment. Vibrations caused by crew activity, on-board experiments, support systems stems (pumps, fans, etc.), periodic orbital maneuvers, and water dumps can all cause perturbations to the microgravity environment. In addition, the drag on the space vehicle is a source of acceleration. Therefore, it is necessary to predict the impact of these vibration-perturbations and the steady-state drag acceleration on the experiments. These predictions can be used to design mission timelines, so that the experiment is run during times that the impact of the acceleration environment is acceptable for the experiment of interest. The simulations reported herein were conducted using a finite element model that includes mass, species, momentum, and energy conservation. This model predicts the existence of "channels" within the processing mushy zone and subsequently "freckles" within the fully processed solid, which are the effects of thermosolutal convection. It is necessary to mitigate thermosolutal convection during space experiments of metal alloys, in order to study and characterize diffusion-controlled transport phenomena (microsegregation) that are normally coupled with macrosegregation. The model allows simulation of steady-state and transient acceleration values ranging from no acceleration (0 g), to microgravity conditions ($10(\exp -6)$ to $10(\exp -3)$ g), to terrestrial gravity conditions (1 g). The transient acceleration environments simulated were from the STS-89 SpaceHAB

mission and from the STS-94 SpaceLAB mission. with on-orbit accelerometer data during different mission periods used as inputs for the simulation model. Periods of crew exercise, quiet (no crew activity), and nominal conditions from STS-89 were used as simulation inputs as were periods of nominal. overboard water-dump, and free-drift (no orbit maneuvering operations) from STS-94. Steady-state acceleration environments of 0.0 and 10(exp -6) to 10(exp -1) g were also simulated, to serve as a comparison to the transient data and to assess an acceptable magnitude for the steady-state vehicle drag

Author

Accelerometers; Acceleration (Physics); Solidification; Binary Alloys; Lead (Metal); Antimony; Gravitation; Spaceborne Experiments

20010078926 NASA Langley Research Center, Hampton, VA USA

Earth Entry Vehicle for Mars Sample Return

Mitcheltree, R. A., NASA Langley Research Center, USA; Braun, R. D., NASA Langley Research Center, USA; Hughes, S. J., NASA Langley Research Center, USA; Simonsen, L. C., NASA Langley Research Center, USA; [2000]; 12p; In English; 51st International Astronautics Federation Congress, 2-6 Oct. 2000, Rio de Janeiro, Brazil

Report No.(s): IAF-00-Q.3.04; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The driving requirement for design of a Mars Sample return mission is assuring containment of the returned samples. The impact of this requirement on developmental costs, mass allocation, and design approach of the Earth Entry Vehicle is significant. A simple Earth entry vehicle is described which can meet these requirements and safely transport the Mars Sample Return mission's sample through the Earth's atmosphere to a recoverable location on the surface. Detailed analysis and test are combined with probabilistic risk assessment to design this entirely passive concept that circumvents the potential failure modes of a parachute terminal descent system. The design also possesses features that mitigate other risks during the entry, descent, landing and recovery phases. The results of a full-scale drop test are summarized.

Author

Mars Sample Return Missions; Drop Tests; Atmospheric Entry; Earth Atmosphere; Design Analysis

20010081058 Boeing Co., Seattle, WA USA

Human-Centered Design for the Personal Satellite Assistant

Bradshaw, Jeffrey M., Boeing Co., USA; Sierhuis, Maarten, Research Inst. for Advanced Computer Science, USA; Gawdiak, Yuri, Research Inst. for Advanced Computer Science, USA; Thomas, Hans, Research Inst. for Advanced Computer Science, USA; Greaves, Mark, Boeing Co., USA; Clancey, William J., Research Inst. for Advanced Computer Science, USA; [2000]; 7p; In English; HCI-Aero 2000, [2000], Unknown; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Personal Satellite Assistant (PSA) is a softball-sized flying robot designed to operate autonomously onboard manned spacecraft in pressurized micro-gravity environments. We describe how the Brahms multi-agent modeling and simulation environment in conjunction with a KAoS agent teamwork approach can be used to support human-centered design for the PSA.

Author

Manned Spacecraft; Robots; Microgravity

20010081205 Research Inst. for Advanced Computer Science, Moffett Field, CA USA

From Livingstone to SMV: Formal Verification for Autonomous Spacecrafts

Pecheur, Charles, Research Inst. for Advanced Computer Science, USA; Simmons, Reid, Carnegie-Mellon Univ., USA; [2000]; 11p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To fulfill the needs of its deep space exploration program, NASA is actively supporting research and development in autonomy software. However, the reliable and cost-effective development and validation of autonomy systems poses a tough challenge. Traditional scenario-based testing methods fall short because of the combinatorial explosion of possible situations to be analyzed, and formal verification techniques typically require a tedious, manual modelling by formal method experts. This paper presents the application of formal verification techniques in the development of autonomous controllers based on Livingstone, a model-based health-monitoring system that can detect and diagnose anomalies and suggest possible recovery actions. We present a translator that converts the models used by Livingstone into specifications that can be verified with the SMV model checker. The translation frees the Livingstone developer from the tedious conversion of his design to SMV, and isolates him from the technical details of the SMV program. We describe different aspects of the translation and briefly discuss its application to several NASA domains.

Author

Computer Programs; Autonomy; Program Verification (Computers); Cost Effectiveness; Software Development Tools; Combinatorial Analysis

20010081947 NASA Ames Research Center, Moffett Field, CA USA

Modeling and Simulating Human Activity

Sierhuis, Maarten, Research Inst. for Advanced Computer Science, USA; Clancey, William J., NASA Ames Research Center, USA; vanHoof, Ron, Caelum Research Corp., USA; deHoog, Robert, Amsterdam Univ., Netherlands; [2000]; 11p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes a multi-agent approach for modeling and simulating the activities of humans and systems in organizations when, and by we refer to as work practice modeling. We describe a simulation experiment of the work practice of the Apollo 12 astronauts during the ALSEP offload activity.

Author

Activity (Biology); Human Reactions; Simulation

20

SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information, see also 07 Aircraft Propulsion and Power; 28 Propellants and Fuels; 15 Launch Vehicles and Launch Operations; and 44 Energy Production and Conversion.

20010078909 NASA Marshall Space Flight Center, Huntsville, AL USA

Application of Magnetized Target Fusion to High-Energy Space Propulsion

Thio, Y. C. F., NASA Marshall Space Flight Center, USA; Schmidt, G. R., NASA Marshall Space Flight Center, USA; Kirkpatrick, R. C., Los Alamos National Lab., USA; [2001]; 1p; In English; International Electric Propulsion Conference, 14-19 Oct. 2001, Pasadena, CA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Most fusion propulsion concepts that have been investigated in the past employ some form of inertial or magnetic confinement. Although the prospective performance of these concepts is excellent, the fusion processes on which these concepts are based still require considerable development before they can be seriously considered for actual applications. Furthermore, these processes are encumbered by the need for sophisticated plasma and power handling systems that are generally quite inefficient and have historically resulted in large, massive spacecraft designs. Here we present a comparatively new approach, Magnetized Target Fusion (MTF), which offers a nearer-term avenue for realizing the tremendous performance benefits of fusion propulsion'. The key advantage of MTF is its less demanding requirements for driver energy and power processing. Additional features include: 1) very low system masses and volumes, 2) high gain and relatively low waste heat, 3) substantial utilization of energy from product neutrons, 4) efficient, low peak-power drivers based on existing pulsed power technology, and 5) very high Isp, specific power and thrust. MTF overcomes many of the problems associated with traditional fusion techniques, thus making it particularly attractive for space applications. Isp greater than 50,000 seconds and specific powers greater than 50 kilowatts/kilogram appear feasible using relatively near-term pulse power and plasma gun technology.

Author

Thrust; Technology Utilization; Plasma Guns; Modulation Transfer Function; Fusion Propulsion

20010079105 NASA Marshall Space Flight Center, Huntsville, AL USA

National Rocket Propulsion Materials Plan: A NASA, Department of Defense, and Industry Partnership

Clinton, Raymond G., Jr., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; 2001 ASM/TMS Spring Symposium, 1-2 May 2001, Schenectady, NY, USA; Sponsored by American Society for Metals, USA; No Copyright; Avail: Issuing Activity; Abstract Only

NASA, Department of Defense, and rocket propulsion industry representatives are working together to create a national rocket propulsion materials development roadmap. This "living document" will facilitate collaboration among the partners, leveraging of resources, and will be a highly effective tool for technology development planning. The structuring of the roadmap, and development plan, which will combine the significant efforts of the Integrated High Payoff Rocket Propulsion Technology (IHRPT) Program, and NASA's Integrated Space Transportation Plan (ISTP), is being lead by the IHRPT Materials Working Group (IMWG). The IHRPT Program is a joint DoD, NASA, and industry effort to dramatically improve the nation's rocket propulsion capabilities. This phased program is structured with increasingly challenging goals focused on performance, reliability, and cost to effectively double rocket propulsion capabilities by 2010. The IHRPT program is focused on three propulsion application areas: Boost and Orbit Transfer (both liquid rocket engines and solid rocket motors), Tactical, and Spacecraft. Critical to the success of this initiative is the development and application of advanced materials, processes, and manufacturing technologies. NASA's ISTP is a comprehensive strategy focusing on the aggressive safety, reliability, and

affordability goals for future space transportation systems established by the agency. Key elements of this plan are the 2nd and 3rd Generation Reusable Launch Vehicles (RLV). The affordability and safety goals of these generational systems are, respectively, 10X cheaper and 100X safer by 2010, and 100X cheaper and 10,000X safer by 2025. Accomplishment of these goals requires dramatic and sustained breakthroughs, particularly in the development and the application of advanced material systems. The presentation will provide an overview of the IHRPT materials initiatives, NASA's 2nd and 3rd Generation RLV propulsion materials projects, and the approach for the development of the national rocket propulsion materials roadmap.

Author

Technological Forecasting; Solid Propellant Rocket Engines; Safety; Reliability; Propulsion; Planning; Liquid Propellant Rocket Engines

20010082360 NASA Glenn Research Center, Cleveland, OH USA

Hall Propulsion Technology Development, NASA Glenn Research Center: 50 kW Thruster Technology EXPRESS Ground/Space Correlation

Jankovsky, Robert, NASA Glenn Research Center, USA; Elliott, Fred, NASA Glenn Research Center, USA; ST Day 2000: Risk Reduction for The Next Generations; Oct. 03, 2000; 11p; In English; See also 20010082356; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

It is the goal of this activity to develop 50 kW class Hall thruster technology in support of cost and time critical mission applications such as orbit insertion. NASA Marshall Space Flight Center is tasked to develop technologies that enable cost and travel time reduction of interorbital transportation. Therefore, a key challenge is development of moderate specific impulse (2000-3000 s), high thrust-to-power electric propulsion. NASA Glenn Research Center is responsible for development of a Hall propulsion system to meet these needs. First-phase, sub-scale Hall engine development completed. A 10 kW engine designed, fabricated, and tested. Performance demonstrated is greater than 2400 s, >500 mN thrust over 1000 hours of operation documented.

Derived from text

Engine Design; Hall Thrusters; Spacecraft Propulsion

20010082367 NASA Glenn Research Center, Cleveland, OH USA

Numerical Propulsion System Simulation for Space Transportation

Owen, Karl, NASA Glenn Research Center, USA; ST Day 2000: Risk Reduction for The Next Generations; Oct. 03, 2000; 3p; In English; See also 20010082356; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Current system simulations are mature, difficult to modify, and poorly documented. Probabilistic life prediction techniques for space applications are in their early application stage. Many parts of the full system, variable fidelity simulation, have been demonstrated individually or technology is available from aeronautical applications. A 20% reduction in time to design with improvements in performance and risk reduction is anticipated. GRC software development will proceed with similar development efforts in aeronautical simulations. Where appropriate, parallel efforts will be encouraged/tracked in high risk areas until success is assured.

Derived from text

Prediction Analysis Techniques; Computerized Simulation

20010082368 NASA Glenn Research Center, Cleveland, OH USA

Safe Life Propulsion Design Technologies (3rd Generation Propulsion Research and Technology)

Ellis, Rod, NASA Glenn Research Center, USA; ST Day 2000: Risk Reduction for The Next Generations; Oct. 03, 2000; 10p; In English; See also 20010082356; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The tasks outlined in this viewgraph presentation on safe life propulsion design technologies (third generation propulsion research and technology) include the following: (1) Ceramic matrix composite (CMC) life prediction methods; (2) Life prediction methods for ultra high temperature polymer matrix composites for reusable launch vehicle (RLV) airframe and engine application; (3) Enabling design and life prediction technology for cost effective large-scale utilization of MMCs and innovative metallic material concepts; (4) Probabilistic analysis methods for brittle materials and structures; (5) Damage assessment in CMC propulsion components using nondestructive characterization techniques; and (6) High temperature structural seals for RLV applications.

Derived from text

Ceramic Matrix Composites; Service Life; Prediction Analysis Techniques; Structural Design

20010082907 NASA Ames Research Center, Moffett Field, CA USA

Parallel Unsteady Turbopump Simulations for Liquid Rocket Engines

Kiris, Cetin C., Eloret Corp., USA; Kwak, Dochan, NASA Ames Research Center, USA; Chan, William, Eloret Corp., USA; [2000]; 8p; In English; Supercomputing 2000 Conference, 6-10 Nov. 2000, Dallas, TX, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper reports the progress being made towards complete turbo-pump simulation capability for liquid rocket engines. Space Shuttle Main Engine (SSME) turbo-pump impeller is used as a test case for the performance evaluation of the MPI and hybrid MPI/Open-MP versions of the INS3D code. Then, a computational model of a turbo-pump has been developed for the shuttle upgrade program. Relative motion of the grid system for rotor-stator interaction was obtained by employing overset grid techniques. Time-accuracy of the scheme has been evaluated by using simple test cases. Unsteady computations for SSME turbo-pump, which contains 136 zones with 35 Million grid points, are currently underway on Origin 2000 systems at NASA Ames Research Center. Results from time-accurate simulations with moving boundary capability, and the performance of the parallel versions of the code will be presented in the final paper.

Author

Pump Impellers; Computerized Simulation; Turbine Pumps; Computational Fluid Dynamics

23

CHEMISTRY AND MATERIALS (GENERAL)

Includes general research topics related to the composition, properties, structure, and use of chemical compounds and materials as they relate to aircraft, launch vehicles, and spacecraft. For specific topics in chemistry and materials see categories 24 through 29. For astrochemistry see category 90 Astrophysics.

20010078202 Corrosion Control Consultants and Labs., Inc., Kentwood, MI USA

Alternate Paint Systems for Overcoating Final Report, Jun. 1994 - Sep. 1999

Tinklenberg, G. L.; Oct. 2000; 500p; In English

Report No.(s): PB2001-106880; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche

New Hampshire DOT contracted with Corrosion Control Consultants and Labs, Inc. (CCC&L) to test various generic types of paint systems over existing coatings used on bridges. As part of the research project, CCC&L placed 15 different paint systems on four randomly selected areas of panels, on a series in a New Hampshire DOT Maintenance Yard. All steel surfaces were prepared by hand tool cleaning in a manner typical of field use. There were five basic generic types of coatings: Alkyds (the traditional resin type used by many highway departments), moisture-cure urethanes, epoxies, acrylics and a calcium sulfonate. All five of these were compared to the very traditional lead-based paint used from 1950 to 1980 and, in some cases into the 1980s, by various highway departments. The paint systems were evaluated for four years.

NTIS

Paints; Coatings; Epoxy Resins; Metal Surfaces

20010080456 Search for Extraterrestrial Intelligence Inst., Moffett Field, CA USA

The Sugar Model: Catalytic Flow Reactor Dynamics of Pyruvaldehyde Synthesis from Triose Catalyzed by Poly-L-Lysine Contained in a Dialyzer

Weber, Arthur L., Search for Extraterrestrial Intelligence Inst., USA; [2000]; 1p; In English

Contract(s)/Grant(s): NCC2-1075; No Copyright; Avail: Issuing Activity; Abstract Only

The formation of pyruvaldehyde from triose sugars was catalyzed by poly-L-lysine contained in a small dialyzer (100 MWCO) suspended in a much larger triose substrate reservoir. The polylysine confined in the dialyzer functioned as a catalytic flow reactor that constantly brought in triose from the substrate reservoir by diffusion to offset the drop in triose concentration within the reactor caused by its conversion to pyruvaldehyde. A 400 mM solution of poly-L-lysine contained in a 0.35 ml dialyzer placed in a 120 ml solution of triose substrate (pH 5.5, 40 C) generated pyruvaldehyde 11 -times faster than an a control reaction without the catalytic dialyzer. However, since the catalytic dialyzer's volume was 343-times smaller than the control reaction, the synthetic intensity (rate/volume) of pyruvaldehyde synthesis within the catalytic dialyzer was 3400-times greater than that of the control reaction and substrate solution. A similar result was obtained using a dialyzer with a 500 MWCO value. Acting as a catalytic flow reactor the polylysine catalytic dialyzer synthesized about 3.5 molecules of pyruvaldehyde per lysine residue in 7 days -- an amount of triose equal to twice the weight of the catalyst. At 7 days the catalytic activity of polylysine was 16% of its initial value, a result indicating catalyst-poisoning caused by reaction of pyruvaldehyde with the e-amino groups of polylysine. The dialyzer method of catalyst containment was selected it provides a simple, flexible, and easily manipulated experimental

system for studying the dynamics and evolutionary development of confined autocatalytic processes related to the origin of life under anaerobic conditions.

Author

Catalytic Activity; Sugars; Synthesis (Chemistry); Aldehydes; Lysine

24

COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials.

20010077904 National Aerospace Lab., Structures Div., Tokyo, Japan

Effect of Moisture Absorption on Hot/Wet Compressive Strength of T800H/PMR-15 Carbon/Polyimide

Hamaguchi, Y.; Shimokawa, T.; Katoh, H.; Oct. 2000; 18p; In Japanese; Portions of this document are not fully legible
Report No.(s): PB2001-105889; NAL-TR-1413; Copyright; Avail: National Technical Information Service (NTIS)

The objective of this study is to statistically investigate the effect of moisture absorption on the hot/wet compressive strength of a T800H/PMR-15 carbon/polyimide composite with a quasi-isotropic stacking sequence. Compression tests on moisture absorbed specimens were conducted at 260 C. These tests clarified the compression fracture mode, the effect of moisture absorption on the hot/wet compressive strength, statistical properties and a design allowable of hot/wet compressive strength, the effectiveness of a traveler coupon in monitoring moisture absorption, and the relationship between specimen thickness and hot/wet compressive strength. Important results were as follows: (1) Hot/wet compressive strength was found to be closely related to residual moisture content measured immediately after the test, and (2) The coefficient of variation of hot/wet compressive strength was found to be approximately twice as large as that of room temperature/dry compressive strength.

NTIS

Compressive Strength; Carbon Fiber Reinforced Plastics; Compression Tests; Fracturing; Polyimides

20010078208 Oak Ridge National Lab., Metals and Ceramics Div., TN USA

Mechanics of Creep Deformation in Polymer-Derived Continuous Fiber-Reinforced Ceramic Matrix Composites. CRADA Final Report Final Report

Lara-Curzio, E.; More, K. L.; Boisvert, R.; Szweda, A.; Oct. 2000; 16p; In English; Original contains color illustrations
Report No.(s): DE2001-777651; C/ORNL-93-0242; No Copyright; Avail: Department of Energy Information Bridge

The objective of this Cooperative Research and Development Agreement between Lockheed Martin Energy Research Corporation and Dow Corning Corporation was to study the effects of temperature, stress, fiber type and fiber architecture on the time-dependent deformation and stress-rupture behavior of polymer-derived ceramic matrix composites developed by the Dow Corning Corporation.

NTIS

Creep Properties; Deformation; Fiber Composites; Polymer Matrix Composites

20010079702 National Aerospace Lab., Tokyo Japan

Tensile Material Properties and High Temperature Tensile Strength of SiC Fiber Reinforced Pure Aluminum Composites

Sofue, Y.; Zhou, F.; Ogawa, A.; Dec. 2000; 24p; In Japanese; Portions of this document are not fully legible
Report No.(s): PB2001-106901; NAL-TR-1419; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

With their excellent high-temperature properties and high specific stiffness and strength, metal matrix composites (MMC) find broad applications not only in the aerospace industry, but also in other engineering fields. In this paper, the tensile properties of SiC fiber reinforced pure aluminum, which has potential applications in power transmission systems, were experimentally evaluated in the temperature range from RT to 515 degrees C. Hi-Nicalon tm low-oxygen silicon carbide fibers recently developed by Nippon Carbon were used to unidirectionally reinforce 99.9% pure aluminum (A1090). These specimens had a rectangular or dumbbell shape. The rectangular specimens were used for room temperature testing, in which SiC fibers were aligned in 0 degrees direction, were used for high-temperature testing. Prior to the high-temperature experiments, a 3D FEM analysis was performed to ensure that no unwanted stress concentration existed in the dumbbell specimens.

NTIS

Composite Materials; Silicon Carbides; Tensile Properties; High Temperature; Fiber Composites

20010080458 NASA Marshall Space Flight Center, Huntsville, AL USA

Evaluation of Microcracking in Two Carbon-Fiber/Epoxy-Matrix Composite Cryogenic Tanks

Hodge, A. J., NASA Marshall Space Flight Center, USA; August 2001; 21p; In English; Original contains color illustrations
Report No.(s): NASA/TM-2001-211194; M-1024; NAS 1.15:211194; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two graphite/epoxy cryogenic pressure vessels were evaluated for microcracking. The X-33 LH2 tank lobe skins were extensively examined for microcracks. Specimens were removed from the inner skin of the X-33 tank for tensile testing. The data obtained from these tests were used to model expected microcrack density as a function of stress. Additionally, the laminate used in the Marshall Space Flight Center (MSFC) Composite Conformal, Cryogenic, Common Bulkhead, Aerogel-Insulated Tank (CBAT) was evaluated. Testing was performed in an attempt to predict potential microcracking during testing of the CBAT.

Author

Graphite-Epoxy Composites; Pressure Vessels; X-33 Reusable Launch Vehicle; Storage Tanks; Cryogenic Fluid Storage; Microcracks; Liquid Hydrogen

20010082361 NASA Ames Research Center, Moffett Field, CA USA

Overview of TPS Tasks

Johnson, Sylvia M., NASA Ames Research Center, USA; ST Day 2000: Risk Reduction for The Next Generations; Oct. 03, 2000; 31p; In English; See also 20010082356; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The objectives of the project summarized in this viewgraph presentation are the following: (1) Develop a lightweight and low cost durable Thermal Protection System (TPS) for easy application to reusable launch vehicle payload launchers; (2) Develop quickly processed composite TPS processing and repair techniques; and (3) Develop higher temperature capability tile TPS. The benefits of this technology include reduced installation and operations cost, enhanced payload capability resulting from TPS weight reduction, and enhanced flight envelope and performance resulting from higher temperature capability TPS which can result in improved safety.

Derived from text

Thermal Protection; Weight Reduction; Low Cost; Tiles

20010082363 NASA Langley Research Center, Hampton, VA USA

2nd Generation RLV Airframe Structures and Materials

Johnson, Theodore F., NASA Langley Research Center, USA; ST Day 2000: Risk Reduction for The Next Generations; Oct. 03, 2000; 29p; In English; See also 20010082356; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The goals and objectives of the project summarized in this viewgraph presentation are the following: (1) Develop and demonstrate verified airframe and cryotank structural design and analysis technologies, including damage tolerance, safety, reliability, and residual strength technologies, robust nonlinear shell and cryotank analysis technologies, high-fidelity analysis and design technologies for local structural detail features and joints, and high-fidelity analysis technologies for sandwich structures; (2) Demonstrate low cost, robust materials and processing, including polymeric matrix composite (PMC) and metallic materials and processing, and refractory composite and metallic hot structures materials and processing; (3) Develop and demonstrate robust airframe structures and validated integrated airframe structural concepts, including low cost fabrication and joining, operations efficient designs and inspection techniques (non-destructive evaluation), scale-up and integrated thermal structure tests, and airframe structures IVHM; (4) Demonstrate low cost, robust repair techniques; and (5) Develop verified integrated airframe structural concepts, including integrated structural concepts.

Derived from text

Airframes; Structural Design; Composite Structures; Design Analysis

20010082366 NASA Glenn Research Center, Cleveland, OH USA

Light Weight Long Life Materials and Structures

Glasgow, Tom, NASA Glenn Research Center, USA; ST Day 2000: Risk Reduction for The Next Generations; Oct. 03, 2000; 4p; In English; See also 20010082356; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

High performance materials are enabling or enhancing for numerous engine/vehicle concepts and are critical to meeting safety, cost, and performance goals. A subproject covers polymeric, metallic, and ceramic high temperature materials for rocket propulsion systems. Projects will also include a wide variety of efforts with some fundamental work with late maturity dates.

Derived from text

Engine Design; Rocket Engines; Production Costs; Aerospace Safety

INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY

Includes the analysis, synthesis, and use inorganic and organic compounds; combustion theory; electrochemistry; and photochemistry. For related information see also 34 Fluid Dynamics and Thermodynamics, For astrochemistry see category 90 Astrophysics.

20010077937 Oak Ridge National Lab., TN USA

Investigating the Mechanism of Catalytic Tetraphenylborate Decomposition Using Nuclear Magnetic Resonance Spectrometry: Initial Studies in FY00

Bonnesen, P. V.; Delmau, L. H.; Sloop, F. V.; Dec. 2000; 74p; In English

Report No.(s): DE2001-777644; ORNL/TM-2000/279; No Copyright; Avail: Department of Energy Information Bridge

At the U.S. Department of Energy's Savannah River Site (SRS), the In-Tank Precipitation (ITP) process uses sodium tetraphenylborate (TPB) to decontaminate soluble High Level Waste (HLW) by precipitating radioactive cesium-137. However, palladium, and possibly other metals that are present in HLW stored at the SRS, are suspected of catalyzing the degradation of the TPB. Testing demonstrated that the present system configuration could not cost-effectively meet the safety and production requirements in the presence of the decomposition reaction. A more fundamental understanding of the mechanism of catalytic degradation of TPB is required to provide a sound technical basis for the Small Tank TPB Precipitation Process proposed as an alternative to ITP. The work described herein was undertaken under Technical Task Plan (TTP) ORNL/CF 99/71, entitled Technical Task Plan for Investigating the Mechanism of Catalytic Tetraphenylborate Decomposition Using Nuclear Magnetic Resonance Spectrometry. The objective of this project was to use, to the extent possible, Nuclear Magnetic Resonance (NMR) spectrometry as an analytical method to gain more insight into the kinetics and degradation mechanism of TPB.

NTIS

Catalysis; Systems Engineering; Decomposition; Nuclear Magnetic Resonance

20010079791 Pittsburgh Univ., PA USA

Evaluation of New Mixed Oxides for Use as Sulfur Tolerant Exhaust Gas Catalysts Annual Report, 1 Sep. 1998 - 30 May 1999

2001; 14p; In English; Original contains color illustrations

Report No.(s): PB2001-107175; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The first 8 months of this program has been devoted to the construction and calibration of a microkinetics flow reaction system and the installation and preliminary testing of a new Raman apparatus. A cooperative arrangement was established with Rhodia, Incorporated such that they supply mixed oxide materials for us to evaluate along with our own 'in-house' synthesized materials. The materials have been tested to establish carbon monoxide conversion rates and hydrocarbon conversion rates under both lean and rich reaction conditions and in the absence and presence of sulfur dioxide. Details of these results and plans for the upcoming contract year are provided below.

NTIS

Catalysts; Exhaust Gases; Evaluation; Carbon Monoxide; Sulfur Dioxides

20010080454 Case Western Reserve Univ., Dept. of Mechanical and Aerospace Engineering, Cleveland, OH USA

A Computational Study of Flame Radiation in PMMA Diffusion Flames Including Fuel Vapor Participation

Bedir, Hasan, Case Western Reserve Univ., USA; Tien, James S., Case Western Reserve Univ., USA; 27th Symposium (International) on Combustion; [1998], pp. 2821-2828; In English; 27th Symposium (International) on Combustion, 1998

Contract(s)/Grant(s): NAG3-1046; RTOP 101-12-OA; Copyright; Avail: Issuing Activity

A numerical model of a polymethylmethacrylate (PMMA) diffusion flame in a stagnation-point geometry is solved with flame radiation. A narrow-band radiation model is used with carbon dioxide, water vapor (combustion products), and methylmethacrylate (fuel) vapor as the gaseous participating species. A detailed account of the emission and absorption from these species as well as the net radiative heat flux are given as a function of the flame stretch rate. Flame radiation is more important at low stretch rates. The contributions from carbon dioxide and water vapor to emission increase with decreasing stretch rate because the thicker flames at low stretch rate produce a longer optical path. Because of the different concentrations at the fuel surface, the optical path length of the MMA vapor stays approximately the same with varying stretch rate, therefore contributing to a smaller fraction of the total

emission at low stretch as compared with that at high stretch. Radiative absorption by these gaseous species is substantial and dominated self-absorption. Consequently, the radiative contribution by MMA vapor is mainly as in emitter.

Author

Flame Propagation; Polymethyl Methacrylate; Diffusion Flames; Mathematical Models; Thermal Radiation

20010081591 Rutherford Appleton Lab., ISIS Facility, Chilton, UK

Performance of the New Pyrolytic Graphite Analyser Bank of the IRIS Spectrometer at ISIS- Preliminary Results

Telling, M. T. F.; Campbell, S. I.; Tomkinson, J.; Abbley, D. D.; Bowden, Z. A.; Jan. 19, 2001; ISSN 1358-6254; 15p; In English Report No.(s): PB2001-105867; RAL-TR-2001-001; Copyright; Avail: National Technical Information Service (NTIS)

The pyrolytic graphite (PG) analyzer bank on the IRIS high-resolution inelastic spectrometer at ISIS has been upgraded. While the original design utilized a 6 low by 225-column array of 2mm thick (1 sq. cm.) graphite crystals cooled to 25K, the new design is comprised of 4212 crystal pieces (1mm thick, 18 rows by 234 columns). In addition, the graphite is now cooled close to liquid helium temperature to further improve the sensitivity of the spectrometer. In this report the authors compare the performance of the newly upgraded instrument to resolution and intensity measurements collected prior to the modifications. NTIS

Pyrolytic Graphite; ISIS Satellites; Neutron Spectrometers; Inelastic Scattering; Analyzers

20010081593 Stanford Univ., Flow Physics and Computation Div., Stanford, CA USA

Progress-Variable Approach for Large Eddy Simulation of Turbulent Combustion

Pierce, Charles D., Stanford Univ., USA; Moin, Parviz, Stanford Univ., USA; June 2001; In English; Original contains color illustrations; Sponsored in part by Franklin P. and Caroline Johnson Fellowship

Contract(s)/Grant(s): F49620-95-1-0185

Report No.(s): SU-TF-80; Copyright; Avail: Issuing Activity

A new approach to chemistry modeling for large eddy simulation of turbulent reacting flows is developed. Instead of solving transport equations for all of the numerous species in a typical chemical mechanism and modeling the unclosed chemical source terms, the present study adopts an indirect mapping approach, whereby all of the detailed chemical processes are mapped to a reduced system of tracking scalars. Presently, only two such scalars are considered: a mixture fraction variable, which tracks the mixing of fuel and oxidizer, and a progress variable, which tracks the global extent-of-reaction of the local mixture. The mapping functions, which describe all of the detailed chemical processes with respect to the tracking variables, are determined by solving quasi-steady diffusion-reaction equations with complex chemical kinetics and multicomponent mass diffusion. The performance of the new model is compared to fast chemistry and steady flamelet models for predicting velocity, species concentration, and temperature fields in a methane-fueled coaxial jet combustor for which experimental data are available. The progress-variable approach is able to capture the unsteady, lifted flame dynamics observed in the experiment, and to obtain good agreement with the experimental data and significantly outperform the fast chemistry and steady flamelet models, which both predict an attached flame.

Author

Large Eddy Simulation; Turbulent Combustion; Chemical Reactions; Reaction Kinetics; Temperature Distribution; Turbulent Flow

20010082323 Rice Univ., Dept. of Chemistry, Houston, TX USA

Linear Scaling Density Functional Calculations with Gaussian Orbitals

Scuseria, Gustavo E., Rice Univ., USA; Journal of Physical Chemistry A; 1999; Volume 103, No. 25, pp. 4782-4790; In English; Financial sponsored in part by Welch Foundation and Gaussian, Inc.

Contract(s)/Grant(s): NSF CHE-96-18323; F49620-98-1-0280; NAG2-1112; Copyright; Avail: Issuing Activity

Recent advances in linear scaling algorithms that circumvent the computational bottlenecks of large-scale electronic structure simulations make it possible to carry out density functional calculations with Gaussian orbitals on molecules containing more than 1000 atoms and 15000 basis functions using current workstations and personal computers. This paper discusses the recent theoretical developments that have led to these advances and demonstrates in a series of benchmark calculations the present capabilities of state-of-the-art computational quantum chemistry programs for the prediction of molecular structure and properties.

Author

Computational Chemistry; Quantum Chemistry; Normal Density Functions; Molecular Orbitals

26
METALS AND METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals and metallic materials; and metallurgy.

20010077936 Oak Ridge National Lab., Metals and Ceramics Div., TN USA

Fatigue Properties of Type 316LN Stainless Steel as a Function of Frequency and Waveform

Strizak, J. P.; DiStefano, J. R.; Oct. 2000; 38p; In English

Report No.(s): DE2001-777702; ORNL/TM-2000/270; No Copyright; Avail: Department of Energy Information Bridge

The low cycle fatigue behavior of type 316LN stainless steel was investigated in air and mercury at frequencies from 0.1 to 10 Hz. Cyclic stress ratios (R) of -1 and 0.1 were used with sinusoidal, triangular and positive sawtooth wave forms. Mercury appears to reduce fatigue life at high stress amplitudes, but the endurance limit may be unaffected. Low frequency and mean stress decreased the fatigue endurance limit, but type of waveform did not appear to affect fatigue life under the conditions of these tests.

NTIS

Fatigue (Materials); Stainless Steels

20010078924 Naval Undersea Warfare Center, Newport, RI USA

A Nonresonant Technique to Estimate the Mechanical Material Properties of a Viscoelastic Cylinder

Hull, Andrew J.; Jan. 10, 2001; 51p; In English

Report No.(s): AD-A390490; NUWC-NPT-TR-11,261; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report describes an innovative method for measuring the complex Young's modulus, complex shear modulus, and complex Poisson's ratio of a viscoelastic cylinder. The new nonresonant technique is based on measured transfer functions that are obtained by vibrating the cylinder linearly and rotationally with two different-size masses on its free end. Both masses have their own individual transfer functions, which can be measured and combined to yield the unknown Young's modulus and shear modulus values at every frequency where a measurement is made. Once these moduli are determined, Poisson's ratio can be calculated. The test method is subjected to Monte Carlo simulations to show that it is relatively unaffected by external noise in the data.

DTIC

Viscoelastic Cylinders; Modulus of Elasticity; Poisson Ratio

20010081188 NASA Lewis Research Center, Cleveland, OH USA

The Metallurgical Properties of Tungsten-Iridium Cathodes

Vancil, Bernard K., FDE Associates, USA; Mueller, Robert A., FDE Associates, USA; Steele, Edward R., FDE Associates, USA; Wintucky, Edwin G., NASA Lewis Research Center, USA; Ohlinger, Wayne L.; Applied Surface Science; 1999; ISSN 0169-4332; Volume 146, pp. 39-46; In English

Contract(s)/Grant(s): RTOP 632-50-5D; Copyright; Avail: Issuing Activity

The results of an investigation of the effects of fabrication parameters in die-pressing of tungsten-iridium cathode matrix materials up to phi 0.130 in.(3.3 mm) in diameter are reported. Tungsten-iridium matrix cathodes offer important performance advantages over 'M' cathodes, but their performance has often been erratic and unpredictable. This investigation relies on use of metallographic techniques to easily observe and characterize microstructural properties, such as pore size, distribution and density, as well as area and distribution of different phases. Data and micrographs are presented for five cathode matrix variants, along with limited emission testing results.

Author

Metallurgy; Tungsten; Iridium; Cathodes; Metal Matrix Composites

27
NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see 24 Composite Materials.

20010078207 Oak Ridge National Lab., Energy Div., TN USA

Cost of Automotive Polymer Composites: A Review and Assessment of DOE's Lightweight Materials Composites Research

Das, S.; Jan. 2001; 52p; In English; Original contains color illustrations

Report No.(s): DE2001-777656; ORNL/TM-2000/283; No Copyright; Avail: Department of Energy Information Bridge

Polymer composite materials have been a part of the automotive industry for several decades but economic and technical barriers have constrained their use. To date, these materials have been used for applications with low production volumes because of their shortened lead times and lower investment costs relative to conventional steel fabrication. Although glass fiber-reinforced polymers dominate the composite materials used in automotive applications, other polymer composites, such as carbon fiber-reinforced polymer composites, show great promise. These alternatives are attractive because they offer weight reduction potential twice that of the conventional glass fiber-reinforced thermoset polymers used today. The major thrust of this paper is an examination of the economic viability of polymer composites. The paper also examines how the R&D supported by the U.S. Department of Energy Office of Advanced Automotive Technologies Lightweight Materials Program is responding to the needs of the industry, specifically from an economic viability perspective.

NTIS

Epoxy Matrix Composites; Fiber Composites; Cost Analysis; Research and Development

20010078913 NASA Marshall Space Flight Center, Huntsville, AL USA

Overview of SBIR Phase II Work on Hollow Graphite Fibers

Stallcup, Michael, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; MSFC Technology Days, 9-10 May 2001, Huntsville, AL, USA

Contract(s)/Grant(s): NAS8-00099; No Copyright; Avail: Issuing Activity; Abstract Only

Ultra-Lightweight materials are enabling for producing space based optical components and support structures. Heretofore, innovative designs using existing materials has been the approach to produce lighter-weight optical systems. Graphite fiber reinforced composites, because of their light weight, have been a material of frequent choice to produce space based optical components. Hollow graphite fibers would be lighter than standard solid graphite fibers and, thus, would save weight in optical components. The Phase I SBIR program demonstrated it is possible to produce hollow carbon fibers that have strengths up to 4.2 GPa which are equivalent to commercial fibers, and composites made from the hollow fibers had substantially equivalent composite strengths as commercial fiber composites at a 46% weight savings. The Phase II SBIR program will optimize processing and properties of the hollow carbon fiber and scale-up processing to produce sufficient fiber for fabricating a large ultra-lightweight mirror for delivery to NASA. Information presented here includes an overview of the strength of some preliminary hollow fibers, photographs of those fibers, and a short discussion of future plans.

Author

Optical Equipment; Fiber Composites; Carbon Fibers; Fabrication; Graphite

20010079793 NASA Glenn Research Center, Cleveland, OH USA

The Oxidation Rate of SiC in High Pressure Water Vapor Environments

Opila, Elizabeth J., NASA Glenn Research Center, USA; Robinson, R. Craig, NASA Glenn Research Center, USA; [1999]; 9p; In English; 196TH Meeting of the Electrochemical Society, 17-22 Oct. 1999, Honolulu, HI, USA

Contract(s)/Grant(s): NCC3-444; RTOP 523-42-13; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

CVD SiC and sintered alpha-SiC samples were exposed at 1316 C in a high pressure burner rig at total pressures of 5.7, 15, and 25 atm for times up to 100h. Variations in sample emittance for the first nine hours of exposure were used to determine the thickness of the silica scale as a function of time. After accounting for volatility of silica in water vapor, the parabolic rate constants for SiC in water vapor pressures of 0.7, 1.8 and 3.1 atm were determined. The dependence of the parabolic rate constant on the water vapor pressure yielded a power law exponent of one. Silica growth on SiC is therefore limited by transport of molecular water vapor through the silica scale.

Author

Oxidation; Silicon Dioxide; High Pressure; Water Vapor; Vapor Deposition

20010079992 NASA Glenn Research Center, Cleveland, OH USA

Approaches to New Endcaps for Improved Oxidation Resistance

Meador, Mary Ann B., NASA Glenn Research Center, USA; Frimer, Aryeh A., Bar-Ilan Univ., Israel; [1999]; 2p; In English; American Chemical Society National Meeting, 25-29 Mar., San Francisco, CA, USA

Contract(s)/Grant(s): RTOP 708-31-13; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Norbornenyl-end capped PMR polyimide resins are widely used as polymer matrix composite materials for aircraft engine applications, since they combine ease of processing with good oxidative stability up to 300 C. PMR resins are prepared by a two-step approach involving the initial formation of oligomeric pre-polymers capped at both ends by a latent reactive end cap. The end cap undergoes cross-linking during higher temperature processing, producing the desired low density, high specific strength materials, for PMR- 15. The end cap facilitates processing by controlling the molecular weight of the oligomer and allowing flow before it cross-links. However, after cross-linking, this very end cap accounts for much of the weight loss in the polymer on aging in air at elevated temperatures. Understanding this degradation provides clues for designing new end caps to slow down degradation, and prolong the lifetime of the material.

Author

Oxidation Resistance; Polyimide Resins; Polymer Matrix Composites

20010081824 Air Force Research Lab., USA

The Constitutive Modeling of Thin Films with Randon Material Wrinkles *Final Report*

Murphey, Thomas W., Air Force Research Lab., USA; Mikulas, Martin M., Colorado Univ., USA; July 2001; 13p; In English

Contract(s)/Grant(s): NAG1-2068; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Material wrinkles drastically alter the structural constitutive properties of thin films. Normally linear elastic materials, when wrinkled, become highly nonlinear and initially inelastic. Stiffness' reduced by 99% and negative Poisson's ratios are typically observed. This paper presents an effective continuum constitutive model for the elastic effects of material wrinkles in thin films. The model considers general two-dimensional stress and strain states (simultaneous bi-axial and shear stress/strain) and neglects out of plane bending. The constitutive model is derived from a traditional mechanics analysis of an idealized physical model of random material wrinkles. Model parameters are the directly measurable wrinkle characteristics of amplitude and wavelength. For these reasons, the equations are mechanistic and deterministic. The model is compared with bi-axial tensile test data for wrinkled Kapton(Registered Trademark) HN and is shown to deterministically predict strain as a function of stress with an average RMS error of 22%. On average, fitting the model to test data yields an RMS error of 1.2%

Author

Thin Films; Continuum Modeling; Axial Stress; Stiffness; Stress-Strain Relationships; Root-Mean-Square Errors; Stress Distribution

20010082537 NASA Langley Research Center, Hampton, VA USA

Constitutive Modeling of Nanotube-Reinforced Polymer Composite Systems

Odegard, Gregory M., NASA Langley Research Center, USA; Harik, Vasyi M., Institute for Computer Applications in Science and Engineering, USA; Wise, Kristopher E., NASA Langley Research Center, USA; Gates, Thomas S., NASA Langley Research Center, USA; August 2001; 17p; In English

Contract(s)/Grant(s): RTOP 706-63-51-03

Report No.(s): NASA/TM-2001-211044; L-18094; NAS 1.15:211044; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this study, a technique has been proposed for developing constitutive models for polymer composite systems reinforced with single-walled carbon nanotubes (SWNT). Since the polymer molecules are on the same size scale as the nanotubes, the interaction at the polymer/nanotube interface is highly dependent on the local molecular structure and bonding. At these small length scales, the lattice structures of the nanotube and polymer chains cannot be considered continuous, and the bulk mechanical properties of the SWNT/polymer composites can no longer be determined through traditional micromechanical approaches that are formulated using continuum mechanics. It is proposed herein that the nanotube, the local polymer near the nanotube, and the nanotube/polymer interface can be modeled as an effective continuum fiber using an equivalent-continuum modeling method. The effective fiber retains the local molecular structure and bonding information and serves as a means for incorporating micromechanical analyses for the prediction of bulk mechanical properties of SWNT/polymer composites with various nanotube

sizes and orientations. As an example, the proposed approach is used for the constitutive modeling of two SWNT/polyethylene composite systems, one with continuous and aligned SWNT and the other with discontinuous and randomly aligned nanotubes.

Author

Nanotubes; Continuum Modeling; Molecular Structure; Composite Structures; Polymer Matrix Composites; Polyethylenes; Carbon; Micromechanics

20010082938 NASA Ames Research Center, Moffett Field, CA USA

Laboratory Astrochemistry: Interstellar PAH Analogs

Salama, Farid, NASA Ames Research Center, USA; [2000]; 1p; In English, 4-5 May 2000, Fribourg, Switzerland

Contract(s)/Grant(s): RTOP 344-01-57-41; No Copyright; Avail: Issuing Activity; Abstract Only

Polycyclic aromatic hydrocarbons (PAHs) are now considered to be an important and ubiquitous component of the organic material in space. PAHs are found in a large variety of extraterrestrial materials such as interplanetary dust particles (IDPs) and meteoritic materials. PAHs are also good candidates to account for the infrared emission bands (UIRs) and the diffuse interstellar optical absorption bands (DIBs) detected in various regions of the interstellar medium. The recent observations made with the Infrared Space Observatory (ISO) have confirmed the ubiquitous nature of the UIR bands and their carriers. PAHs are thought to form through chemical reactions in the outflow from carbon-rich stars in a process similar to soot formation. Once injected in the interstellar medium, PAHs are further processed by the interstellar radiation field, interstellar shocks and energetic particles. A major, dedicated, laboratory effort has been undertaken over the past years to measure the physical and chemical characteristics of these complex molecules and their ions under experimental conditions that mimic the interstellar conditions. These measurements require collision-free conditions where the molecules and ions are cold and chemically isolated. The spectroscopy of PAHs under controlled conditions represents an essential diagnostic tool to study the evolution of extraterrestrial PAHs. The Astrochemistry Laboratory program will be discussed through its multiple aspects: objectives, approach and techniques adopted, adaptability to the nature of the problem(s), results and implications for astronomy as well as for molecular spectroscopy. A review of the data generated through laboratory simulations of space environments and the role these data have played in our current understanding of the properties of interstellar PAHs will be presented. The discussion will also introduce the newest generation of laboratory experiments that are currently being developed in order to provide a closer simulation of space environments and a better support to space missions.

Author

Energetic Particles; Interstellar Matter; Polycyclic Aromatic Hydrocarbons; Organic Materials

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PROPELLANTS AND FUELS

Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For nuclear fuels see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

20010078916 NASA Marshall Space Flight Center, Huntsville, AL USA

Vapor Growth of Binary and Ternary Chalcogenides in Preparation for Microgravity Experiments

Su, Ching-Hua, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; Infrared Materials Workshop, 1-3 Apr. 2001, Nashville, TN, USA; No Copyright; Avail: Issuing Activity; Abstract Only

In the bulk crystal growth of some technologically important semiconducting chalcopyrites, such as ZnTe, CdS, ZnSe and ZnS, vapor growth techniques have significant advantages over melt growth techniques due to the high melting points of these materials. The realization of routine production of high-quality single crystals of these semiconductors requires a fundamental, systematic and in-depth study on the PVT growth process and crystal growth by vapor transport in low gravity offers a set of unique conditions for this study. Previously, two reasons have been put forward to account for this. The first is weight-related reductions in crystal strain and defects. These are thought to be caused by the weight of the crystals during processing at elevated temperatures and retained on cooling, particularly for materials with a low yield strength. The second, and more general, reason is related to the reduction in density-gradient driven convection. The PVT crystal growth process consists of essentially three processes: sublimation of the source material, transport of the vapor species and condensation of the vapor species to form the crystal. The latter two processes can be affected by the convection caused by gravitational accelerations on Earth. Reductions in such convection in low gravity is expected to yield a nearly diffusion-limited growth condition which results in more uniform growth rates (on the microscopic scale) and hence greater crystalline perfection and compositional homogeneity. The reduction of

convective contamination by performing flight experiments in a reduced gravity environment will help to understand the relation between fluid phase processes (growth parameters) and defect and impurity incorporation in grown crystals.

Author

Vapor Deposition; Chalcogenides; Binary Mixtures; Crystal Growth; Semiconductors (Materials); Zinc Tellurides; Zinc Sulfides

20010082538 TRW Systems Group, Advanced Technology Dept., Redondo Beach, CA USA

A Study to Analyze the Permeation of High Density Gases and Propellant Vapors Through Single Layer Teflon or Teflon Structure Materials and Laminations, Volume 1 Interim Report, 5 Jul. 1966 - 5 Oct. 1967

Johnson, R. L., TRW Systems Group, USA; Oct. 25, 1967; 127p; In English

Contract(s)/Grant(s): NAS7-505

Report No.(s): TRW-07282-6016-R000-Vol-1; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report contains the results of a fifteen month analytical and experimental study of the leakage rate of the pressurant gases (N₂, He) and the propellant vapors (N₂O₄, N₂H₄) through bladder structures consisting of two layers of Teflon separated by a metallic foil diffusion barrier containing microscopic or larger holes. Results were obtained for the steady state leakage rate through circular holes and long rectangular openings in the barrier for arbitrary thicknesses of the two Teflon layers. The effect of hole shape and relative hole position on the leakage rate were studied. The transient problem was analyzed and it was shown that steady state calculations are adequate for estimating the leakage rate. A computer program entitled "Diffusion Analyzer Program" was developed to calculate the leakage rate, both transient and steady state. Finally, the analytical results were compared to experimentally determined values of the leakage rate through a model laminated bladder structure. The results of the analysis are in good agreement with experiment. The experimental effort (Part II of the Bladder Permeation Program) measured the solubility, diffusion coefficient and permeability of helium, nitrogen and nitrogen tetroxide vapor through Teflon TFE and FEP membranes. Data were obtained in the temperature range of 25 to 100 C at pressures ranging from near vacuum to about 20 atmospheres. Results of the experimental effort were compared with the limited data previously reported. As a verification to the applicability of results to actual bladder systems, counter diffusion tests were performed with a laminated sample containing aluminum foil with a selected group of holes.

Author

Teflon (Trademark); Propellants; Leakage; Diffusion; Membrane Structures; Gas Dynamics

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SPACE PROCESSING

Includes space-based development of materials, compounds, and processes for research or commercial application. Also includes the development of materials and compounds in simulated reduced-gravity environments. For legal aspects of space commercialization see 84 Law, Political Science and Space Policy.

20010079993 NASA Glenn Research Center, Cleveland, OH USA

Measurement and Data Distribution for Microgravity Accelerations on the International Space Station

McPherson, Kevin, NASA Glenn Research Center, USA; Hrovat, Kenneth, Tal-Cut Co., USA; [1999]; 12p; In English; 50th International Astronautical Congress, 4-8 Oct. 1999, Amsterdam, Netherlands; Sponsored by International Astronautical Federation

Contract(s)/Grant(s): NAS3-27254; RTOP 398-95-0G

Report No.(s): IAF-99-J.2.05; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two accelerometer systems will be available on the International Space Station to support microgravity payloads with information about the quasi-steady and vibratory acceleration environment of the research facilities. The Microgravity Acceleration Measurement System will record contributions to the quasi-steady microgravity environment, including the influences of aerodynamic drag, vehicle rotation, and venting effects. The Space Acceleration Measurement System-II will measure vibratory disturbances on-board due to vehicle, crew, and equipment disturbances. Due to the dynamic nature of the microgravity environment and its potential to influence sensitive experiments, NASA's Principal Investigator Microgravity Services project has initiated a plan through which the data from these instruments will be distributed to researchers in a timely and meaningful fashion. Beyond the obvious benefit of correlation between accelerations and the scientific phenomena being studied, such information is also useful for hardware developers who can gain qualitative and quantitative feedback about their facility acceleration output to station.

Author

Acceleration Measurement; Microgravity; Accelerometers; Payloads

20010081823 NASA Marshall Space Flight Center, Huntsville, AL USA

An Indirect Mixed-Sensitivity Approach to Microgravity Vibration Isolation: The Exploitation of Kinematic Coupling In Frequency-Weighting Design-Filter Selections

Hampton, R. David, Alabama Univ., USA; Whorton, Mark S., NASA Marshall Space Flight Center, USA; [2000]; 5p; In English Report No.(s): ACC00-AIAA0036; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Many space science experiments need an active isolation system to provide them with the requisite microgravity environment. The isolation systems planned for use with the International Space Station have been appropriately modeled using relative position, relative velocity, and acceleration states. In theory, frequency design filters can be applied to these state-space models, in order to develop optimal H, or mixed-norm controllers with desired stability- and performance characteristics. In practice, however, the kinematic coupling among the various states can lead, through the associated frequency-weighting-filters, to conflicting demands on the Riccati design "machinery." The results can be numerically ill-conditioned regulator and estimator Riccati equations and/or reduced intuition in the design process. In addition, kinematic coupling can result in a redundancy in the demands imposed by the frequency weights. Failure properly to account for this type of coupling can lead to an unnecessary increase in controller dimensionality and, in turn, controller complexity. This paper suggests a rational approach to the assignment of frequency weighting design filters, in the presence of the kinematic coupling among states that exists in the microgravity vibration isolation problem.

Author

Microgravity; Vibration Isolators; Kinematics; Aerospace Sciences

20010082944 NASA Ames Research Center, Moffett Field, CA USA

Development of a High Output Fluorescent Light Module for the Commercial Plant Biotechnology Facility

Turner, Mark, NASA Ames Research Center, USA; Zhou, Wei-Jia, NASA Ames Research Center, USA; [2000]; 1p; In English Contract(s)/Grant(s): RTOP 493-36-02; No Copyright; Avail: Issuing Activity; Abstract Only

To maximize the use of available resources provided onboard the International Space Station, the development of an efficient lighting system is critical to the overall performance of the CPBF. Not only is it important to efficiently generate photon energy, but thermal loads on the CPBF Temperature and Humidity Control System must be minimized. By utilizing optical coatings designed to produce highly diffuse reflectance in the visible wavelengths while minimizing reflectance in the infrared region, the design of the fluorescent light module for the CPBF is optimized for maximum photon flux, spatial uniformity and energy efficiency. Since the Fluorescent Light Module must be fully enclosed to meet (ISS) requirements for containment of particulates and toxic materials, heat removal from the lights presented some unique design challenges. By using the Express Rack moderate C, temperature-cooling loop, heat is rejected by means of a liquid/air coolant manifold. Heat transfer to the manifold is performed by conduction using copper fins, by forced air convection using miniature fans, and by radiation using optically selective coatings that absorb in the infrared wavelengths. Using this combination of heat transfer mechanisms builds in redundancy to prevent thermal build up and premature bulb failure.

Author

Biotechnology; Fluorescence; Illuminating; Industrial Plants

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ENGINEERING (GENERAL)

Includes general research topics to engineering and applied physics, and particular areas of vacuum technology, industrial engineering, cryogenics, and fire prevention. For specific topics in engineering see categories 32 through 39.

20010077816 NASA Glenn Research Center, Cleveland, OH USA

Mechanical Components Branch Overview

Space Mechanisms Technology Workshop; June 2001, pp. 1-9; In English; See also 20010077815; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Mr. James Zakrajsek, chief of the Mechanical Components Branch, presented an overview of research conducted by the branch. Branch members perform basic research on mechanical components and systems, including gears and bearings, turbine seals, structural and thermal barrier seals, and space mechanisms. The research is focused on propulsion systems for present and advanced aerospace vehicles. For rotorcraft and conventional aircraft, we conduct research to develop technology needed to enable the design of low noise, ultra safe geared drive systems. We develop and validate analytical models for gear crack propagation, gear dynamics and noise, gear diagnostics, bearing dynamics, and thermal analyses of gear systems using experimental data from various component test rigs. In seal research we develop and test advanced turbine seal concepts to

increase efficiency and durability of turbine engines. We perform experimental and analytical research to develop advanced thermal barrier seals and structural seals for current and next generation space vehicles. In space mechanisms, we conduct fundamental research on lubricants, materials, components and mechanisms subjected to deep space and planetary environments. Derived from text

Mechanical Engineering; Aerospace Vehicles; Rocket-Based Combined-Cycle Engines; General Overviews

20010081057 Research and Technology Organization, Applied Vehicle Technology Panel, Neuilly-sur-Seine, France

NATO East-West Workshop on Magnetic Materials for Power Applications *Atelier OTAN Est-Ouest sur les Matériaux Magnétiques pour Applications Propulsives*

August 2001; 58p; In English, 25-30 Jun. 2000, Marathon, Greece; CD-ROM contains the entire document in PDF format

Report No.(s): RTO-TR-031; AC/323(AVT-060)TP/36; ISBN 92-837-1060-6; Copyright Waived; Avail: CASI; C01, CD-ROM; A04, Hardcopy; A01, Microfiche

The NATO Workshop with Partners for Peace on Advanced Magnetic Materials for More Electric Vehicles and Electric Pulse Power Weapons (AVT-060) was organised with the aim of assessing the need for improved magnetic materials primarily in future generations of more electric vehicles and (to a lesser extent) in electric pulse power weapons. Scientists from eight NATO countries and five non-NATO countries participated. Recent advancements and further improvements were discussed: 1) Applications; 2) Fundamental and Technical Magnetism; 3) Characterisation; 4) Materials; 5) Novel Processing; and 6) foundations for future co-operation were established.

Author

Electric Motor Vehicles; Magnetic Materials; Magnetic Properties; Electric Power Supplies; Military Vehicles

20010082326 Research and Technology Organization, Systems Concepts and Integration Panel, Neuilly-sur-Seine, France

Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components *Stratégies Visant à Atténuer l'Obsolescence des Systèmes par l'Emploi de Composants du Commerce*

June 2001; 270p; In English; In French, 23-25 Oct. 2000, Budapest, Hungary; See also 20010082327 through 20010082355; Original contains color illustrations

Report No.(s): RTO-MP-072; AC/323(SCI-084)TP/31; ISBN 92-837-0020-1; Copyright Waived; Avail: CASI; A12, Hardcopy; C01, CD-ROM; A03, Microfiche

The meeting proceedings from this symposium on 'Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components' was organized and sponsored by the Systems Concepts and Integration (SCI) Panel of the Research and Technology Organization of NATO in Budapest, Hungary from 23 to 25 October 2000. The symposium's goal was to propose new strategies for obsolescence management including open architecture, functional partitioning and technology insertion that have to be addressed during system engineering, detailed design, production, and product support. The symposium outlined actual problems and solutions to the issue of obsolescence by the entire defense system community. It also addressed burning questions related to the problem of parts obsolescence and diminishing, manufacturing sources and material shortages. Management tools and methodologies to cope with the risk of obsolescence were discussed. This included new design concepts and system architectures to allow advanced technology insertion during the system life cycle. Session topics were organized under the four topics of: (1) status and experience with commercial off-the-shelf technology in defense electronic systems; (2) obsolescence management tools; (3) new design concepts and architectures to combat obsolescence; and (4) strategies and initiatives for life cycle management.

CASI

Commercial Off-The-Shelf Products; Conferences; Systems Engineering; Defense Industry; Avionics; Electronic Equipment; Computer Programs

20010082327 BAE Systems Avionics Ltd., Edinburgh, UK

Technical Evaluation Report

Lynch, David, BAE Systems Avionics Ltd., UK; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. T-1 - T-8; In English; See also 20010082326; Copyright Waived; Avail: CASI; A02, Hardcopy

Since 1997 the Research and Technology Organisation (RTO) has been NATO's single focus for defense research and information interchange. The System and Concepts Integration (SCI) panel is one of six panels that cover the scientific and technical disciplines that bear upon defense issues. The SCI panel deals with advanced system concepts, integration, engineering techniques and technologies applicable to all platforms and operating environments, concentrating on mid to long term system level operational needs. During the period of operation of the RTO and the SCI panel, very significant changes have taken place in the area of defense procurement. The ever increasing cost of acquiring military hardware and software, together with major

shifts in the electronics marketplace, prompted Defense Acquisition Reform in the USA as an attempt to leverage the defense dollar through utilization of commercial technology advances. The decision, prompted by the now famous 'Perry Memorandum' of 1994, to move towards performance based specifications led to the virtual abandonment of the MTL-STD and MIL-SPEC system that had underpinned military procurement for several decades. At the same time the market in semiconductors was increasingly being driven towards commercial telecommunications and computing needs, resulting in a reducing number of types and sources of military components. This effect has also been felt, although to a lesser extent, in the material supply and nonsemiconductor component markets. In combination these effects produce an ongoing obsolescence problem for legacy, or fielded, defense systems worldwide. The impact of Diminishing Manufacturing Sources and Material Shortages (DMSMS) can vary from the merely irritating to the showstopper. It is of grave concern to the NATO governments and the Defense and Aerospace industry, and the rate of discontinuance of part availability is steadily increasing. Many programs such as the F-22 stealth fighter, AWACS, Tornado, and Eurofighter are suffering from obsolescence. Concurrently with this increasing rate of military part obsolescence has come a progressive acceptance of the use of Commercial Off The Shelf (COTS) components, assemblies and systems in the defense arena. It is against this background that the SCI panel initiated this symposium.

Author

Defense Industry; Management Systems; Commercial Off-The-Shelf Products

20010082329 Teldix Luftfahrt-Ausruestungs G.m.b.H., Heidelberg, Germany

The Use of Commercial Components in Defense Equipment to Mitigate Obsolescence: A Contradiction in Itself?

Petersen, Lutz, Teldix Luftfahrt-Ausruestungs G.m.b.H., Germany; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 1-1 - 1-8; In English; See also 20010082326; Copyright Waived; Avail: CASI; A02, Hardcopy

The paper identifies and discusses the presently unresolved contradictions between the requirements of the national customers (MODs or Purchasing Agencies) and the viable options the industry can offer to mitigate the adverse effects of obsolescence for defense material with emphasis on the extended use of commercial off-the-shelf products.

Author

Commercial Off-The-Shelf Products; User Requirements; Technology Utilization

20010082330 Dy 4 Systems, Inc., Kanata, Ontario Canada

New Approaches to Processor Lifecycle Management

Young, Duncan, Dy 4 Systems, Inc., Canada; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 2-1 - 2-4; In English; See also 20010082326; Original contains color illustrations; Copyright Waived; Avail: CASI; A01, Hardcopy

There is a growing discontinuity between the semiconductor supply chain and the requirements of military programs to support equipment in the field for long periods of time - typically for 15 years or even longer. This isn't news any more, it was a natural consequence of the Commercial Off-the-Shelf Products (COTS) Procurement Initiatives and the shift in focus of the semiconductor supply industry, started early in the 1990s, to much larger and ever more lucrative markets. While COTS was embraced enthusiastically at the outset by our community, some of the real issues are only now beginning to come home to roost, tainting COTS as a standard for doing business. This is apparent through the performance of some suppliers, particularly in their attitudes and commitment to obsolescence and real lifecycle management. This paper has been written from the perspective of a COTS, open architecture, board-level supplier and is intended to provide insight and guidance for the selection and management of a supplier when considering various options of overall system lifecycle management.

Author

Commercial Off-The-Shelf Products; Industries

20010082333 Naval Air Warfare Center, Aircraft Div., Lakehurst, NJ USA

Risk-Based COTS Systems Engineering Assessment Model: A Systems Engineering Management Tool and Assessment Methodology to Cope with the Risk of Commercial Off-the-Shelf (COTS) Technology Insertion During the System Life Cycle

Lebron, Ruben A., Jr., Naval Air Warfare Center, USA; Rossi, Robert, Naval Air Warfare Center, USA; Foor, William, Naval Air Warfare Center, USA; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 7-1 - 7-12; In English; See also 20010082326; Copyright Waived; Avail: CASI; A03, Hardcopy

Due to the rising costs of today's weapon systems, the US Department of Defense (DOD) continues to implement strategies to reform its acquisition and procurement process. One such strategy seeks to reduce the cost of developing systems by purchasing commercial off-the-shelf (COTS) technology. The COTS technology ranges from components used to build a particular weapon

system to functional pieces of gear used to support the weapon system, i.e., support equipment. The COTS technology may be instituted at the inception of the weapon system design or it may be inserted into the support of the weapon system at any point during its life cycle. The COTS technology is intended to reduce weapon system life-cycle costs by minimizing the expense of system design and testing.

Derived from text

Commercial Off-The-Shelf Products; Weapon Systems; Government Procurement

20010082337 Alenia Difesa, Graphic and Computing Dept., Pomezia, Italy

The Obsolescence Management Based on a "Pro-Active" Approach in Conjunction with a "Pre-Planned" Technology Insertion Route

Buratti, Marco, Alenia Difesa, Italy; DelBrusco, Daniele, Alenia Difesa, Italy; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 12-1 - 12-15; In English; See also 20010082326; Copyright Waived; Avail: CASI; A03, Hardcopy

Parts obsolescence was affecting all Alenia products/programs so that we had to identify a robust strategy to prevent uncontrolled effects. The design of products family has taken the obsolescence management issue as key basic requirement. The basic ideas on the back of our pro-active approach for obsolescence issues are: (1) All products (in terms of equipment, subsystem, or systems) design shall offers a flexible, open architecture which permits to change a specific functional block maintaining unchanged the overall architecture; (2) The open architecture used shall facilitate any design changes into the defined functional blocks (caused by obsolescence issues) because of the high level of interface standardization; (3) A product configuration for a pre-determined period of time shall be maintained by performing components buy for all expected production batches including logistic support, allowance, and spares; (4) There will be a defined periodic product enhancement which permit a pre-planned obsolescence removal activities and relevant design changes; (5) There will be an high level of backward compatibility between the updated system configuration and the previous one; (6) Technologies which support the product enhancement will be consolidated and introduced at a point where the level of risk is considered acceptable (or obsolescence became a major issue; (7) There will be a 'synchronized technology insertion route' defined in the frame of the Company strategies which takes into account customers' requirements and market trend; (8) The obsolescence removal activity can't be 'just in case' but needs to be anticipated and synchronized with a new technology insertion phase and or a step for a product enhancement; and (9) There is an absolute need for a company organization capable of provide continuous market survey so that any corrective action can be taken on time for a minor changes or a major synchronised product upgrade change.

Author

Standardization; Management Systems; Technology Utilization

20010082338 Thomson-CSF, Technologies et Methodes, Orsay, France

Generic Tools and Methods for Obsolescence Control

Gaillat, Gerard, Thomson-CSF, France; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 14-1 - 14-13; In English; See also 20010082326; Original contains color illustrations; Copyright Waived; Avail: CASI; A03, Hardcopy

The increasing discrepancy between the life cycles of professional electronics equipment and the life cycles of the components (which are largely intended for volume markets) means that professional electronics manufacturers must implement methods, processes, and tools to give their customers long-term availability guarantees for their products despite obsolescence problems in the components. Although this effort must be made at the level of each unit and adapted to the type of product, the customers' needs and internal organization, the existence of common methodological tools and principles can significantly help each unit set up the appropriate procedure for their particular case. This paper gives an overview of the methods and tools set up within the Thomson-CSF group to support the units in this procedure. These can be split into four levels, which correspond to increasing maturity of the obsolescence risk control: Level 1 is the curative level (during production and use phases); Level 2 is the downstream preventive level (also during production and use phases); Level 3 is the upstream preventive level (during development phase); and Level 4 is the upstream preventive level (during design phase). Finally, it asserts that controlling obsolescence and being able to guarantee the long-term availability of equipment is now a major part of the professional electronics manufacturer's job, and is an increasingly important factor in meeting customers' needs.

Author

Technology Utilization; Service Life; Systems Engineering

20010082341 Matra BAe Dynamics, Velizy-Villacoublay, France

SoC: A New Approach to Enhance System Performances and to Combat the Long-Term Availability Issue *SoC: Une Nouvelle Approche de l'Amélioration des Performances des Systèmes pour Combattre les Problèmes de Disponibilité à Long Terme*

Butel, P., Matra BAe Dynamics, France; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 17-1 - 17-9; In French; See also 20010082326; Original contains color illustrations; Copyright Waived; Avail: CASI; A02, Hardcopy

Since military applications have lost their leadership in the field of electronics they will be used increasingly for civilian technologies, it will be necessary to learn how to use them or to adapt them to our specific needs, low production volumes, and high operating temperatures, for example. The use of what is customary to call 'off-the-shelf components' will continue even if the assurance of being able to supply them over the long term is a non-negligible factor. But another technology, which also comes from the civilian sector, seems to hold promise: the 'systems on a chip' or 'SoC.' In other words, the possibility of integrating a complete computer in a single circuit or a reduced number of circuits, that will satisfy, for example, the need for a piloting/guidance application for a missile. This approach is now well satisfied in the civilian and industrial world such as telecommunications, but still implemented to a rather small degree in defense systems.

Author

Systems-On-A-Chip; Military Technology; Technology Transfer

20010082346 Defence Evaluation Research Agency, Systems and Software Engineering Centre, Malvern, UK

Planning for Change with a Holistic View of the System

Dowling, Ted, Defence Evaluation Research Agency, UK; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 22-1 - 22-8; In English; See also 20010082326; Copyright Waived; Avail: CASI; A02, Hardcopy

The example of obsolescence which perhaps comes most readily to mind is that of electronic components that are no longer available. However, this is just a special case of the more general form of obsolescence that arises when a system no longer provides an adequate solution to a user's problem. This may arise because the problem has changed or because the solution (the system) has, in some way. In practice, both the problem and solution are changing continuously and asynchronously. The approach to obsolescence management proposed here depends on recognizing and planning for this change. In essence, it involves looking forward to how the demands on the system and the technology that provides its capability may both change. Simulation is a crucial tool in doing this. In the light of the understanding of expected changes, the design of the current system is arranged to facilitate transition to the modified system and a change plan is produced. This paper also looks briefly at the impact of the proposed approach on the broader system engineering activities and the commitment it requires from the system's customer.

Author

Computerized Simulation; Systems Engineering; Replacing; Systems Management

20010082350 Stratum Management Ltd., Micheldever, UK

Management Issues in the Use of Commercial Components in Military Systems

Ellis, Richard, Stratum Management Ltd., UK; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 26-1 - 26-10; In English; See also 20010082326; Copyright Waived; Avail: CASI; A02, Hardcopy

Commercial off the shelf (COTS) products are being used increasingly in military systems, an approach that offers many advantages including lower initial acquisition costs, faster delivery to the front line and ability to utilize the latest advances in technology - a seemingly perfect match to the 'faster, better, cheaper' ethos of modern acquisition initiatives. COTS products do, however, bring their own problems, including rapid obsolescence, lack of product control and fixed functionality optimized for the non-military market. In addition to addressing the complex technical issues that the use of COTS products brings, Defense Ministries and Industry will have to adapt their management approach and practices if the full potential of using commercial technology is to be realized, and dangerous pitfalls avoided. This paper discusses some of the management issues that will have to be addressed and draws a number of lessons relating to the avoidance of obsolescence problems during the in-service life of a system or platform.

Author

Commercial Off-The-Shelf Products; Defense Industry; Systems Management

20010082353 Defence Evaluation Research Agency, Whole Life Support Dept., Bromley, UK

Future Initiatives for Obsolescence Mitigation Strategies

Smith, Ted, Defence Evaluation Research Agency, UK; Strategies to Mitigate Obsolescence in Defense Systems Using

Commercial Components; June 2001, pp. 30-1 - 30-13; In English; See also 20010082326; Original contains color illustrations; Copyright Waived; Avail: CASI; A03, Hardcopy

The accelerating pace of technology change requires new approaches to the design, manufacture and through life support of military and long life cycle commercial platforms to minimize the effects of short-term technology obsolescence. The purpose of this paper is to describe medium and long-term strategies for the mitigation of obsolescence currently being considered in the UK. All complex military equipments are at risk from the effects of unmanaged technology obsolescence before and after they enter service. A systems engineering approach is described for the evolution of strategies that would involve co-operation between users and manufacturers to produce affordable through life solutions.

Author

Systems Engineering; Technology Utilization; Systems Management

32

COMMUNICATIONS AND RADAR

Includes radar; radio, wire, and optical communications; land and global communications; communications theory. For related information see also 04 Aircraft Communications and Navigation; and 17 Space Communications, Spacecraft Communications, Command and Tracking; for search and rescue see 03 Air Transportation and Safety, and 16 Space Transportation and Safety.

20010079945 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK

Modelling and Verification of Communicating Processes in the Event of Interface Difference

Burton, J.; Koutny, M.; Pappalardo, G.; Jul. 2000; 48p

Report No.(s): PB2001-106870; CS-TR-696; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

We extend our investigation of the notion that a system built of communicating processes is an acceptable implementation of another base or target system, in the case that respective specification and implementation processes have different interfaces and we combine into a single scheme implementation relations previously presented. We also relax significantly the restrictions place upon target processes. Using this implementation relation scheme, two basic kinds of results are obtained: realizability and compositionality. The former ensures that implementations may be put to good use; in practice, this means that plugging in implementation into an appropriate environment should yield a conventional implementation of the target. The latter requires that a target composed of several connected systems may be implemented by connecting their respective implementations.

NTIS

Mathematical Models; Proving; Computer Networks

20010081948 NASA Ames Research Center, Moffett Field, CA USA

IsoWAN: A NASA Science and Engineering Information and Services Framework

Korsmeyer, David J., NASA Ames Research Center, USA; Chow, Edward T., Jet Propulsion Lab., California Inst. of Tech., USA; Conroy, Michael P., NASA Kennedy Space Center, USA; [2000]; 6p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We believe that the next evolutionary step in supporting wide-area application and services delivery to customers is a network framework that provides for collocation of applications and services at distinct sites in the network, an interconnection between these sites that is performance optimized for these applications, and value-added services for applications. We use the term IsoWAN to describe an advanced, isolated network interconnect services framework that will enable applications to be more secure, and able to access and be in use in both local and remote environments. The main functions of an IsoWAN are virtual localization of application services, an application service interface, coordinated delivery of applications and associated data to the customer, and supporting collaborative application development for customers. An initial pilot network between three NASA Centers: Ames Research Center, the Jet Propulsion Laboratory, and Marshall Space Flight Center, has been built and its properties will be discussed.

Author

Networks; Position (Location)

20010082335 Thomson-CSF Detexis, Elancourt, France

Minimizing the Software Re-Design in Obsolescent Radar Processors with Functional Radar Simulation and Software Workshop

Lacomme, Philippe, Thomson-CSF Detexis, France; Baret, Veronique, Thomson-CSF Detexis, France; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 9-1 - 9-4; In English; See also 20010082326;

Original contains color illustrations; Copyright Waived; Avail: CASI; A01, Hardcopy

Signal and Data Processors are the sub-assemblies which are the most likely obsolescent parts in modern airborne Radars. As their architecture is based on multiple parallel commercial off-the-shelf (COTS) processors, the implementation of the algorithms in these processors is a costly and time consuming task which represents the most significant part of the cost when the sub-assembly has to be replaced due to component obsolescence. The use of a powerful software work-shop is the way to dramatically cut the cost of the software redesign by an extended re-use policy. A significant improvement in the radar development cycle can be achieved through simulation techniques. These new tools and methodology enables to reduce costs and to shorten the radar modes development cycle. During the phase of specification, a functional radar prototype is developed, requirements are defined, and testing procedures are developed. This functional radar prototype is completely independent of the processor hardware and survives to COTS obsolescence. During the phase of on-board functional software development, the functional prototype is re-used to simulate the machine architecture (processors in parallel, communications, etc.) and the algorithms are optimized for the target processor hardware. During the testing phase, a cross test between the functional prototype and the on-board functional software can be performed by the re-use of the testing procedures. Also, the flight tests can be prepared by the simulation of the scenario to be played. The designer can be assisted by a tools for all this developments.

Author

Prototypes; Computerized Simulation; Airborne Radar

20010082345 European Aeronautic Defence and Space Co., Airborne Systems, Ulm Germany

A Modular Signal Processing Architecture to Mitigate Obsolescence in Airborne Systems

Rothmaier, Markus, European Aeronautic Defence and Space Co., Germany; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 21-1 - 21-8; In English; See also 20010082326; Original contains color illustrations; Copyright Waived; Avail: CASI; A02, Hardcopy

After providing an introduction to the obsolescence problem, this paper explains how the topic is handled to date, using an airborne radar system development as an example. In this, the supplier primarily reacts on obsolete components with post design measures. In contrast to this a pro-active approach is suggested that starts with defining an architecture that eases the substitution of obsolete components and allows upgrades without involving major redesigns. This includes the need to safeguard the effort spend for developing and qualifying application software. The article presents a modular structured signal processing architecture that employs commercial off-the-shelf (COTS) modules and standards. It discusses the ability of such an architecture to cope with the obsolescence problem by separating interfaces from processing units and applying COTS interface standards. Means of the designer are examined that allow to proactively design a processor that is likely to survive hardware and software component changes at minimum cost. Forming standard building blocks that encapsulate processing functions is presented as an approach that will considerably reduce the involved risk.

Author

Signal Processing; Architecture (Computers); Airborne Radar; Avionics

20010082348 Rohde and Schwartz, Radiocommunications Systems Div., Munich, Germany

Software Radios for Maximum Flexibility and Interoperability

Leschhorn, Ruediger, Rohde and Schwartz, Germany; Pensel, Karlheinz, Rohde and Schwartz, Germany; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 24-1 - 24-7; In English; See also 20010082326; Copyright Waived; Avail: CASI; A02, Hardcopy

The upcoming Software Radios will change the commercial as well as the military market of radio communications. Due to their programmability Software Radios offer an extreme flexibility falling into three main domains: Multirole, Multimode, and Multiband operation. Multiband just means that the radio can cover the complete spectrum from HF to SHF, Multimode requests to cope with different air interfaces, and Multirole addresses the question of which applications a software radio has to serve. Essential properties of a software radio architecture, particularly supporting the use of commercial off-the-shelf (COTS) components and mitigating parts obsolescence, are the strict decoupling of application software and platform hardware (forming APIs) together with a consequent modularization of the hardware. The decoupling allows hardware-independent development of the application software, whilst the hardware modularization supports a cyclic reengineering process in case components have to be replaced by new COTS parts. Savings in term of logistic and upgrades reduce the overall life-cycle costs by about 40% in comparison with conventional radios. In turn, these platforms are free to be scaled to manpack, airborne, naval, or stationary deployment, simultaneously optimized for example in terms of power saving, size, or flexibility, where the software layer

guarantees interoperability among these radio families by common waveforms. An example of an existing military software radio is presented showing multiband, multimode, and multirole features.

Author

Radio Communication; Radio Equipment; Computer Programs; Military Technology

20010082940 DVZ Joint Ventures, Bethesda, MD USA

Guide to the EU Directive on Electromagnetic Compatibility

Delaney, H., Editor; vandeZande, R., Editor; Jun. 2001; 58p; In English

Report No.(s): PB2001-105513; NIST/GCR-01/813; No Copyright; Avail: CASI; A01, Microfiche; A04, Hardcopy

This guide is an easy-to-use introductory reference for industry and government officials on the requirements of the European Union's (EU) Electromagnetic Compatibility (EMC) Directive. It is designed to help business and government officials understand the purpose of the directive, its relationship to other directives, the essential requirements contained in the directive, and the basic steps necessary for compliance. The guide offers explanations of such requirements as: the products covered by the directive, the products excluded from coverage under the directives, differences in the essential requirements for components, finished product, systems and installations. The guide contains the text of the directive and a list of applicable standards.

NTIS

Electromagnetic Compatibility; Telecommunication

33

ELECTRONICS AND ELECTRICAL ENGINEERING

Includes development, performance, and maintainability of electrical/electronic devices and components; related test equipment. and microelectronics and integrated circuitry. For related information see also 60 Computer Operations and Hardware; and 76 Solid-State Physics. For communications equipment and devices see 32 Communications and Radar.

20010077858 Helsinki Univ. of Technology, Electron Physics Lab., Espoo, Finland

Helsinki Univ. of Technology, Electron Physics Lab. Annual Report, 200

Hovinen, A.; 2000; 72p; In English

Report No.(s): PB2001-105997; Copyright; Avail: National Technical Information Service (NTIS)

The Electron Physics Laboratory (EPL) with Helsinki University of Technology (HUT) provides higher education and research in the field of modern semiconductor technology. The activities include semiconductor physics, processing and measurement technology of semiconductor devices, Integrated Circuit (IC) technology, and microsensors. The authors' first priority is to provide high technical background for students considering the rapidly growing Finnish semiconductor industry. Electron Physics Laboratory is a member of laboratory of HUT Microelectronics Center, which provides clean room and semiconductor processing facilities for research and educational purposes. The research activity in Electron Physics Laboratory during last years have included processing of low-cost high-efficiency silicon solar cells, light-emitting silicon superlattices, characterization of defects in silicon, and nanotechnology.

NTIS

Microelectronics; Nanotechnology; Semiconductors (Materials); Electrophysics; Research and Development

20010078917 NASA Marshall Space Flight Center, Huntsville, AL USA

X-Ray Characterization of Structural Defects in Seeded and Self-Seeded ZnSe Crystal Grown by PVT in Horizontal and Vertical Configurations

Raghothamachar, B., State Univ. of New York, USA; Dudley, M., State Univ. of New York, USA; Su, C.-H., NASA Marshall Space Flight Center, USA; Volz, H. M., Wisconsin Univ., USA; Matyi, R., Wisconsin Univ., USA; [2001]; 1p; In English; 13th American Conference on Crystal Growth and Epitaxy, 12 Aug. 2001, Burlington, VT, USA; No Copyright; Avail: Issuing Activity; Abstract Only

As part of a pre-flight ground based investigation of crystal growth of II-VI compound semiconductors, a number of ZnSe boules have been grown by physical vapor transport (PVT) at Marshall Space Flight Center. Boules were grown in both horizontal and vertical configurations and seeded and self-seeded growth techniques were employed. As-grown and/or cleaved boules were examined by a combination of synchrotron white beam x-ray topography (SWBXT) and high resolution triple axis diffraction (HRTXD) to characterized the structural defects and correlate them with the growth conditions. Horizontal grown boules tend to grow away from the ampoule wall (contactless growth) and generally exhibit large (110) facets parallel to the gravity vector. Vertical grown boules grew to the full diameter of the ampoule and exhibited no faceting. X-ray topography combined with back

reflection x-ray diffraction revealed the presence of lamellar twins (180 deg type about the [111] axis) in horizontal grown boules while vertically grown boules contain a few large grains, some of which are twinned. X-ray topographs and reciprocal space maps recorded from the boules show the better crystal quality of horizontal grown boules. The relationship between crystal quality and gravity vector is investigated. Further, an attempt is made to extend the Hurlé theory of twin nucleation in Czochralski grown crystals to explain the twinning mechanisms in horizontal grown boules.

Author

X Ray Diffraction; Boules; Crystal Growth; Defects; Diffraction; Grain Size; Structural Analysis

20010079108 NASA Marshall Space Flight Center, Huntsville, AL USA

A Compact X-Ray System for Support of High Throughput Crystallography

Ciszak, Ewa, NASA Marshall Space Flight Center, USA; Gubarev, Mikhail, NASA Marshall Space Flight Center, USA; Gibson, Walter M., State Univ. of New York, USA; Joy, Marshall K., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; European Crystallographic Meeting, 25 Aug. 2001, Cracow, Poland; No Copyright; Avail: Issuing Activity; Abstract Only

Standard x-ray systems for crystallography rely on massive generators coupled with optics that guide X-ray beams onto the crystal sample. Optics for single-crystal diffractometry include total reflection mirrors, polycapillary optics or graded multilayer monochromators. The benefit of using polycapillary optic is that it can collect x-rays over the greatest solid angle, and thus most efficiently, utilize the greatest portion of X-rays emitted from the Source. The x-ray generator has to have a small anode spot, and thus its size and power requirements can be substantially reduced. We present the design and results from the first high flux x-ray system for crystallography that combines a microfocus X-ray generator (40microns FWHM Spot size at a power of 45 W) and a collimating, polycapillary optic. Diffraction data collected from small test crystals with cell dimensions up to 160Å (lysozyme and thaumatin) are of high quality. For example, diffraction data collected from a lysozyme crystal at RT yielded R=5.0% for data extending to 1.70Å. We compare these results with measurements taken from standard crystallographic systems. Our current microfocus X-ray diffraction system is attractive for supporting crystal growth research in the standard crystallography laboratory as well as in remote, automated crystal growth laboratory. Its small volume, light-weight, and low power requirements are sufficient to have it installed in unique environments, i.e.. on-board International Space Station.

Author

X Rays; Crystallography; Collimation; Monochromators; Design Analysis; Data Acquisition

20010079693 Rutherford Appleton Lab., Chilton UK

Pin Pixel Detector, X-ray Imaging

Bateman, J. E.; Connolly, J. F.; Derbyshire, G. E.; Duxbury, D. M.; March, A. S.; Jan. 29, 2001; 20p

Report No.(s): PB2001-105868; RAL-TR-2001-009; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

The development and testing of a soft x-ray gas pixel detector, which uses connector pins for the anodes is reported. Based on a commercial 100 pin connector block, a prototype detector of aperture 25.4mm x 25.4mm can be economically fabricated. The individual pin anodes all show the expected characteristics of small gas detectors capable of counting rates reaching 1MHz per pin. A 2-dimensional resistive divide readout system has been developed to permit the imaging properties of the detector to be explored in advance of true pixel readout electronics.

NTIS

Gas Detectors; Pixels; Fabrication; Performance Tests; X Ray Detectors; X Ray Imagery

20010082328 Defense Micro-Electronic Activity, Sacramento, CA USA

USA Department of Defense Initiatives for the Management and Mitigation of Microelectronics Obsolescence

Glum, Ted, Defense Micro-Electronic Activity, USA; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. K-1 - K-2; In English; See also 20010082326; Copyright Waived; Avail: CASI; A01, Hardcopy

The USA Department of Defense (US DoD) and its allies increasingly rely on 'smart' weapon systems to provide both a strategic and tactical edge on the battlefield. The components that make these systems smart are the complex microelectronics devices that form the core of their functional capability. However, this same semiconductor technology upon which we rely turns over every 18 months or less and is normally supported for no more than six to seven years. Yet the US DoD and its allies keep their weapon systems in operation for ever-increasing periods of time, and often requiring the availability of 'unique' microelectronics devices for 20 or more years. Therefore, the problem facing the DoD and its allies is not the ability to acquire advanced technology during weapon system development, but rather the inability to acquire this technology during the out-years

in order to keep hi-tech weapon systems supported. This emphasizes the need for the development of management techniques and solution based strategies to handle the problem of microelectronics obsolescence.

Author

Management Methods; Microelectronics; Semiconductors (Materials); Weapon Systems

20010082334 Matra BAe Dynamics, Velizy-Villacoublay, France

Methodological Guide to ASIC Design with Durability Management "COCISPER: Conception Circuits Integres Specifiques et Perennite"

Barre, M., Matra BAe Dynamics, France; Butel, P., Matra BAe Dynamics, France; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 8-1 - 8-7; In English; See also 20010082326; Original contains color illustrations; Copyright Waived; Avail: CASI; A02, Hardcopy

The military sector is characterized by specific aspects such as small series, high reliability, long life-cycle products. In this context, the DGA wished to set up means to develop specific integrated circuits for the durability of electronic systems. Thus, in 1995, a first COCISPER contract has been awarded to a Consortium fully representative of the industry in France. It is aimed to establish a methodology guide for designing Application Specific Integrated Circuits (ASIC) taking into account the needs for system durability. Therefore, it defines an industrial standard following the withdrawal of mil-spec ones. The guide produced within this project specifies the general development plan of numeric integrated circuits at the ASIC design process level, but also at the equipment and system specification, validation and qualification stages. It proposes recommendations applicable to the whole industry. A follow-up study has been awarded to the same Consortium in 1998 which aims at experimenting and validating the COCISPER guide on real applications, but also at updating it to take into account the Programmable Logic Devices (PLD) and recent techniques such as the use of Virtual Components. In addition, an evolution of the guide facilitating the access to information has been asked. A HMTL version is now developed and available.

Author

Application Specific Integrated Circuits; Durability

20010082532 Helsinki Univ. of Technology, Lab. of Electromechanics, Espoo, Finland

International conference on electrical machines, ICEM 2000, Volume 2

2000; 648p; In English, 28-30 Aug. 2000, Espoo, Finland

Report No.(s): PB2001-106359; ISBN 951-22-5097-7; Copyright; Avail: National Technical Information Service (NTIS)

Partial Contents: A Comprehensive Analysis of the Current Status in Low Voltage Induction motor Diagnosis; Rotor Losses in Permanent Magnet High-Speed Machines; Magnetic Field and Inductance of Helical Armature Windings; Effect of Sleeve Conductivity on Rotor Eddy Current Loss in High-Speed PM Machines; Robust Field Oriented Control of Induction Motors; A Simplified Stator Resistance Estimator for a Speed Sensorless Stator Flux Field Oriented Controller; Experimental Determination of Magnetization Curves of Switched Reluctance Motors; Encoderless Motion Control Systems Using Smart SKF Sensor Bearings; Rotor Fault Diagnosis of Induction Motors Based on a Dynamic Associative Memory of Chaotic Neural Network; Simulation and Validation of Two-Frequency Heat Run Test for Induction Machines by Time Stepping Finite Element Method; Partial Discharge Activity and its Role in Monitoring the Condition of High Voltage Stator Windings.

NTIS

Conferences; Induction Motors; Rotors; Magnetic Fields; Error Analysis

20010082936 Lund Univ., Sweden

A Critical Analysis of Reliability-Centred Maintenance as a Management Tool

Sherwin, David J.; International Journal of COMADEM; July 2001; ISSN 1363-7681; Volume 4, No. 3, pp. 12-21; In English; Copyright; Avail: Issuing Activity

Maintenance should be based on the intrinsic RAM properties of the machinery to be maintained, and cost-optimized. Because maintenance acts on parts, data collection and analysis must also be at that level. Data costs are failing and optimization methods are improving; yet the maintenance industry still resists change. This is at least partly because the books on RCM contain some wrong ideas which spoil it as a basis for terotechnological investigation and amelioration. The paper first demolishes some of the tenets of RCM, then shows how these myths have delayed progress and finally makes suggestions for a system of maintenance based more truly upon reliability. The points are illustrated by examples.

Author

Maintenance; Mathematical Models; Reliability Analysis; Economics

FLUID MECHANICS AND THERMODYNAMICS

Includes fluid dynamics and kinematics and all forms of heat transfer; boundary layer flow; hydrodynamics; hydraulics; fluidics; mass transfer and ablation cooling. For related information see also 02 Aerodynamics.

20010077935 Sandia National Labs., Albuquerque, NM USA

Gridless Compressible Flow: A White Paper

Strickland, J. H.; Feb. 2001; 54p; In English

Report No.(s): DE2001-780296; SAND2001-0527; No Copyright; Avail: Department of Energy Information Bridge

Sandia National Laboratories has been tasked with the simulation of nuclear weapons parachute performance. These high performance parachutes must operate under a variety of conditions some of which are in the compressible flow regime. As part of the Accelerated Strategic Computing Initiative (ASCI), Sandia has developed a 3D incompressible gridless vortex code (VIPAR) which is capable of simulating unsteady bluff-body flow over time-dependent geometries. In the present paper, the notion of extending classical incompressible gridless vortex methods into the compressible regime is discussed along with possible directions which one might take to eventually obtain a mature algorithm. The general motivation for extending the gridless vortex method is to be able to capitalize upon its inherent advantages (no gridding in the fluid volume, limited computational domains, easily satisfied farfield boundary conditions, etc.).

NTIS

Compressible Flow; Parachutes; Nuclear Weapons

20010078210 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Projective Structure and Integrable Geodesic Flows on the Extension of Bott-Virasoro Group

Guha, P.; May 2000; 21p; In English

Report No.(s): PB2001-105845; IHES/M/00/38; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is a sequel to the authors' paper IHES/M/00/23, triggered from a question posed by Marcel-Ovsienko-Roger in their paper (Lett. Math. Phys. 40 (1997) 31-39). In this paper the authors show that the multicomponent (or vector) Ito equation, modified dispersive water wave equation and modified dispersionless long wave equation are the geodesic flows. The authors also study the projective structure associated with the matrix Strum-Liouville operators on the circle.

NTIS

Geodesy; Water Waves; Wave Equations

20010078211 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Vortex Tube Stretching and Instabilities in an Inviscid Fluid

Friedlander, S.; Apr. 2000; 22p; In English

Report No.(s): PB2001-105843; IHES/P/00/55; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The authors study instabilities that are present in two models that retain some of the dynamics of vortex tube stretching in the motions of a fluid in 3 dimensions. Both models are governed by a 2-dimensional PDE and are hence more tractable than the full 3-dimensional Euler equations. The first model is the so called surface quasi-geostrophic equation. The second model is a class of 3-dimensional flows that are invariant with respect to one spatial coordinate. Both models are constructed in the context of a rapidly rotating fluid. Instabilities due to an effect analogous to vortex tube stretching are detected: these instabilities are in the linearized equations in the first model and in the nonlinear equations in the second model. Such instabilities are absent, or weaker, in strictly 2-dimensional fluid motion.

NTIS

Partial Differential Equations; Inviscid Flow; Hilsch Tubes; Nonlinear Equations; Rotating Fluids

20010081060 NASA Ames Research Center, Moffett Field, CA USA

On Animating 2D Velocity Fields

Kao, David, NASA Ames Research Center, USA; Pang, Alex, California Univ., USA; [2000]; 12p; In English; IEEE Visualization 2000, 2000, Unknown; Sponsored by Institute of Electrical and Electronics Engineers, USA

Contract(s)/Grant(s): NCC2-5281; LLNL-B347879; W-7405-eng-48; N66001-97-8900; NSF ACI-96-19020; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A velocity field, even one that represents a steady state flow implies a dynamical system. Animated velocity fields is an important tool in understanding such complex phenomena. This paper looks at a number of techniques that animate velocity fields and propose two new alternatives, These are texture advection and streamline cycling. The common theme among these

techniques is the use of advection on some texture to generate a realistic animation of the velocity field. Texture synthesis and selection for these methods are presented. Strengths and weaknesses of the techniques are also discussed in conjunction with several examples.

Author

Velocity Distribution; Advection; Equilibrium Flow; Cycles

20010081324 NASA Ames Research Center, Moffett Field, CA USA

Automatic Generation of OpenMP Directives and Its Application to Computational Fluid Dynamics Codes

Yan, Jerry, NASA Ames Research Center, USA; Jin, Haoqiang, Computer Sciences Corp., USA; Frumkin, Michael, Computer Sciences Corp., USA; [2000]; 15p; In English; WOMPEI Conference, Oct. 2000

Contract(s)/Grant(s): NAS2-14303; NAS2-37056; RTOP 509-10-31; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The shared-memory programming model is a very effective way to achieve parallelism on shared memory parallel computers. As great progress was made in hardware and software technologies, performance of parallel programs with compiler directives has demonstrated large improvement. The introduction of OpenMP directives, the industrial standard for shared-memory programming, has minimized the issue of portability. In this study, we have extended CAPTools, a computer-aided parallelization toolkit, to automatically generate OpenMP-based parallel programs with nominal user assistance. We outline techniques used in the implementation of the tool and discuss the application of this tool on the NAS Parallel Benchmarks and several computational fluid dynamics codes. This work demonstrates the great potential of using the tool to quickly port parallel programs and also achieve good performance that exceeds some of the commercial tools.

Author

Computational Fluid Dynamics; Computer Programs; Software Engineering; Memory (Computers); Compilers

20010082038 Computer Sciences Corp., Moffett Field, CA USA

Parallel and Distributed Computational Fluid Dynamics: Experimental Results and Challenges

Djomehri, Mohammad Jahed, Computer Sciences Corp., USA; Biswas, R., Computer Sciences Corp., USA; VanderWijngaart, R., Computer Sciences Corp., USA; Yarrow, M., Computer Sciences Corp., USA; [2000]; 26p; In English; HiPC2000, 17-20 Dec. 2000, Bangalore, India

Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes several results of parallel and distributed computing using a large scale production flow solver program. A coarse grained parallelization based on clustering of discretization grids combined with partitioning of large grids for load balancing is presented. An assessment is given of its performance on distributed and distributed-shared memory platforms using large scale scientific problems. An experiment with this solver, adapted to a Wide Area Network execution environment is presented. We also give a comparative performance assessment of computation and communication times on both the tightly and loosely-coupled machines.

Author

Parallel Processing (Computers); Distributed Memory; Computational Fluid Dynamics; Problem Solving

20010082516 NASA Ames Research Center, Moffett Field, CA USA

Summary of CFD Methods for Potential Extensions to Earth Simulation

Kwak, Dochan, NASA Ames Research Center, USA; [2000]; 13p; In English; Japanese Earth Simulator Project, 18-19 Jul. 2000, Tokyo, Japan; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Current Computational Fluid Dynamics methods for extensions to Earth Simulation are presented in viewgraph form.

CASI

Computational Fluid Dynamics; Aerodynamic Configurations; Algorithms; Earth (Planet)

20010082523 Massachusetts Inst. of Tech., Dept. of Aeronautics, Cambridge, MA USA

Unstructured Mesh Methods for the Simulation of Hypersonic Flows Final Report, 23 Dec. 1998 - 31 Mar. 2001

Peraire, Jaime, Massachusetts Inst. of Tech., USA; [2001]; 70p; In English

Contract(s)/Grant(s): NAG1-2122

Report No.(s): MIT-OSP-6803900; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report describes the research work undertaken at the Massachusetts Institute of Technology. The aim of this research is to identify effective algorithms and methodologies for the efficient and routine solution of hypersonic viscous flows about

re-entry vehicles. For over ten years we have received support from NASA to develop unstructured mesh methods for Computational Fluid Dynamics. As a result of this effort a methodology based on the use, of unstructured adapted meshes of tetrahedra and finite volume flow solvers has been developed. A number of gridding algorithms flow solvers, and adaptive strategies have been proposed. The most successful algorithms developed from the basis of the unstructured mesh system FELISA. The FELISA system has been extensively for the analysis of transonic and hypersonic flows about complete vehicle configurations. The system is highly automatic and allows for the routine aerodynamic analysis of complex configurations starting from CAD data. The code has been parallelized and utilizes efficient solution algorithms. For hypersonic flows, a version of the, code which incorporates real gas effects, has been produced. One of the latest developments before the start of this grant was to extend the system to include viscous effects. This required the development of viscous generators, capable of generating the anisotropic grids required to represent boundary layers, and viscous flow solvers. In figures I and 2, we show some sample hypersonic viscous computations using the developed viscous generators and solvers. Although these initial results were encouraging, it became apparent that in order to develop a fully functional capability for viscous flows, several advances in gridding, solution accuracy, robustness and efficiency were required. As part of this research we have developed: 1) automatic meshing techniques and the corresponding computer codes have been delivered to NASA and implemented into the GridEx system, 2) a finite element algorithm for the solution of the viscous compressible flow equations which can solve flows all the way down to the incompressible limit and that can use higher order (quadratic) approximations leading to highly accurate answers, and 3) and iterative algebraic multigrid solution techniques.

Derived from text

Computational Fluid Dynamics; Hypersonic Flow; Unstructured Grids (Mathematics); Computerized Simulation; Reentry Vehicles

35

INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gauges; detectors; cameras and photographic supplies; and holography. For aerial photography see 43 Earth Resources and Remote Sensing. For related information see also 06 Avionics and Aircraft Instrumentation; and 19 Spacecraft Instrumentation.

20010079655 NASA Goddard Space Flight Center, Greenbelt, MD USA

EUNIS; Extreme-Ultraviolet Normal-Incidence Spectrometer

Thomas, Roger J., NASA Goddard Space Flight Center, USA; Davila, Joseph M., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; 2001 Spring Meeting, Greenbelt, MD, USA; Sponsored by American Astronomical Society, USA
Contract(s)/Grant(s): RTOP 344-17-38; No Copyright; Avail: Issuing Activity; Abstract Only

GSFC is in the process of assembling an Extreme-Ultraviolet Normal Incidence Spectrometer called EUNIS, to be flown as a sounding rocket payload. The instrument builds on the many technical innovations pioneered by our highly successful SERTS experiment, which has now flown a total of ten times, most recently last summer. The new design will have somewhat improved spatial and spectral resolutions, as well as two orders of magnitude greater sensitivity, permitting high signal/noise EUV spectroscopy with a temporal resolution near 1 second for the first time ever. In order to achieve such high time cadence, a novel detector system is being developed, based on Active-Pixel-Sensor electronics, a key component of our design.

Author

Extreme Ultraviolet Radiation; Ultraviolet Spectrometers; Telescopes; Imaging Techniques

20010079940 Naval Research Lab., Space Science Div., Washington, DC USA

SOLAR-B Mission Extreme Ultraviolet (EUV) Imaging Spectrometer (EIS) Instrument Components *Monthly Report, Period ending 31 Jul. 2001*

Doschek, George A., Naval Research Lab., USA; Aug. 15, 2001; 32p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This Monthly Progress Report covers the reporting period July 2001 of the Detailed Design and Development through Launch plus Thirty Days, Phase C/D, for selected components and subsystems of the Extreme Ultraviolet Imaging Spectrometer (EIS) instrument, hereafter referred to as EIS Instrument Components. This document contains the program status through the reporting period and forecasts the status for the upcoming reporting period.

Author

Extreme Ultraviolet Radiation; Imaging Techniques; Subassemblies; Space Missions; Ultraviolet Spectrometers

20010080455 NASA Glenn Research Center, Cleveland, OH USA

A Precise Calibration Technique for Measuring High Gas Temperatures

Gokoglu, Suleyman, A., NASA Glenn Research Center, USA; Schultz, Donald F., NASA Glenn Research Center, USA; Combustion Science and Technology Journal; [2000]; 26p; In English; Mediterranean Combustion Symposium - 1999, 20-25 Jun. 1999, Antalya, Turkey

Contract(s)/Grant(s): RTOP 963-15-0B; RTOP 101-12-0A; Copyright; Avail: Issuing Activity

A technique was developed for direct measurements of gas temperatures in the range of 2050K - 2700K with improved accuracy and reproducibility. The technique utilized the low-emittance of certain pure, metal-oxide fibers whose diameters varied from 60 - 400 micrometers in the experiments. The uncertainty of the technique was limited by the uncertainty in the melting points of the materials, i.e., +/- 15K. The abrupt increase in the emittance of the fibers upon melting was utilized as indication of reaching a known gas temperature. The accuracy of the technique was confirmed by both the fiber-diameter independence of the results and by the calculated low emittance values of transparent fibers, of order 0.01 at a few degrees below their melting point. This melting-point temperature was approached by increments smaller than 4K, accomplished by controlled increases of reactant flow rates in H₂/air or H₂/O₂ flames. As applications, the technique was used (a) for assessing the uncertainty in thermocouple measurements for inferring gas temperatures, and (b) for calibrating an IR camera to measure gas temperatures, thereby demonstrating its capability as an excellent calibration reference.

Author

Gas Temperature; High Temperature Gases; Thermocouples; Optical Measurement

20010081594 Minnesota Univ., Particle Technology Lab., Minneapolis, MN USA

A Nanometer Aerosol Size Analyzer (nASA) for Rapid Measurement of High-Concentration Size Distributions *Final Report*

Han, Hee-Siew, Minnesota Univ., USA; Chen, Da-Ren, Minnesota Univ., USA; Pui, David Y. H., Minnesota Univ., USA; Anderson, Bruce E., Minnesota Univ., USA; Aug. 01, 2001; 28p; In English

Contract(s)/Grant(s): NCC1-311; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have developed a fast-response Nanometer Aerosol Size Analyzer (nASA) that is capable of scanning 30 size channels between 3 and 100 nm in a total time of 3 seconds. The analyzer includes a bipolar charger (P0210), an extended-length Nanometer Differential Mobility Analyzer (Nano-DMA), and an electrometer (TSI 3068). This combination of components provides particle size spectra at a scan rate of 0.1 second per channel free of uncertainties caused by response-time-induced smearing. The nASA thus offers a fast response for aerosol size distribution measurements in high-concentration conditions and also eliminates the need for applying a de-smearing algorithm to resulting data. In addition, because of its thermodynamically stable means of particle detection, the nASA is useful for applications requiring measurements over a broad range of sample pressures and temperatures. Indeed, experimental transfer functions determined for the extended-length Nano-DMA using the Tandem Differential Mobility Analyzer (TDMA) technique indicate the nASA provides good size resolution at pressures as low as 200 Torr. Also, as was demonstrated in tests to characterize the soot emissions from the J85-GE engine of a T38 aircraft, the broad dynamic concentration range of the nASA makes it particularly suitable for studies of combustion or particle formation processes. Further details of the nASA performance as well as results from calibrations, laboratory tests and field applications are presented.

Author

Aerosols; Algorithms; Combustion Physics; Particle Size Distribution; Detection; Measuring Instruments

20010082357 NASA Glenn Research Center, Cleveland, OH USA

Information Rich Test Instrumentation

Mercer, Carolyn, NASA Glenn Research Center, USA; Hunter, Gary, NASA Glenn Research Center, USA; ST Day 2000: Risk Reduction for The Next Generations; Oct. 03, 2000; 6p; In English; See also 20010082356; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The goals of the project described in this viewgraph presentation are the following: (1) Increase safety by understanding operating conditions and component capabilities; and (2) Reduce development and operating costs by reducing testing and design cycle times and reducing engine weight and increasing component life. The objectives are to determine cooling system effectiveness and structural loads.

Derived from text

Cooling Systems; Cost Reduction; Safety; System Effectiveness

37
MECHANICAL ENGINEERING

Includes mechanical devices and equipment; machine elements and processes. For cases where the application of a device or the host vehicle is emphasized see also the specific category where the application or vehicle is treated. For robotics see 63 Cybernetics, Artificial Intelligence, and Robotics; and 54 Man/System Technology and Life Support.

20010077815 NASA Glenn Research Center, Cleveland, OH USA

Space Mechanisms Technology Workshop

Oswald, Fred B., Editor, NASA Glenn Research Center, USA; Space Mechanisms Technology Workshop; June 2001; 41p; In English; Space Mechanisms Technology Workshop, 2 Nov. 2000, Cleveland, OH, USA; See also 20010077816 through 20010077818

Contract(s)/Grant(s): RTOP 712-20-13

Report No.(s): NASA/CP-2001-210971; NAS 1.55:210971; E-12825; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Mechanical Components Branch at NASA Glenn Research Center hosted a workshop to discuss the state of drive systems technology needed for space exploration. The Workshop was held Thursday, November 2, 2000. About 70 space mechanisms experts shared their experiences from working in this field and considered technology development that will be needed to support future space exploration in the next 10 to 30 years.

Author

Aerospace Engineering; Technology Utilization; Mechanical Drives

20010077911 Oak Ridge National Lab., TN USA

Assessment of Recuperator Materials for Microturbines

Omatete, O. O.; Maziasz, P. J.; Pint, B. A.; Stinton, D. P.; Dec. 2000; 36p; In English

Report No.(s): DE2001-777668; ORNL/TM-2000/304; No Copyright; Avail: Department of Energy Information Bridge

The purpose of this study is to evaluate and assess recuperator technology for advanced microturbines. The first section reviews the different options for gas turbine cycles and discusses the relevance of each cycle to microturbines. The section concludes that a heat exchanger (recuperator) is necessary to achieve a reasonable and competitive level of efficiency. The second section provides further information on the types of heat exchangers and their efficiency. The next section gives an update on current metal recuperators and the potential to increase temperature capability through alloy development. The final section discusses the status and potential of ceramic materials.

NTIS

Regenerators; Heat Exchangers; Gas Turbines

20010082358 NASA Glenn Research Center, Cleveland, OH USA

Turbine Based Combined/Combination Cycle/RTA Project Overview

Bartolotta, Paul A., NASA Glenn Research Center, USA; Quigley, Brian F., NASA Glenn Research Center, USA; ST Day 2000: Risk Reduction for The Next Generations; Oct. 03, 2000; 8p; In English; See also 20010082356; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

This viewgraph presentation gives an overview of the Revolutionary Turbine Accelerator (RTA) program. Details are given on the Single Stage To Orbit (SSTO) and Two Stage to Orbit (TSTO) aircraft, and the technological challenges associated with the RTA, SSTO, and TSTO.

CASI

Single Stage to Orbit Vehicles; Two Stage Turbines; Accelerators

20010082939 Office of Naval Research, Mechanics and Energy Conversion S and T Div., Arlington, VA USA

Progress and Future Research Directions of Active Noise and Vibration Control

Ng, Kam W., Office of Naval Research, USA; International Journal of COMADEM; July 2001; ISSN 1363-7681; Volume 4, No. 3, pp. 29-33; In English; Copyright; Avail: Issuing Activity

Active control of noise and vibration has received a great deal of attention in recent years. Accordingly, substantial progress has been made in understanding the principle, development, and applications of active control technique. This paper provides an overview of the progress made in active noise and vibration control technology. Research and development efforts in fully active and active/passive control on the various applications are discussed. Technical challenges and issues, such as broadband control,

transient operation, complex structures and systems, and controller instability are addressed. Furthermore, recommendations and future research directions are discussed.

Author

Active Control; Algorithms; Vibration; Noise (Sound)

20010082956 Bharat Heavy Electricals Ltd., Corporate Research and Development Div., Hyderabad, India

Analysis of Bearings and Lubricants in Electrical Environment: A State-of-the-Art Review

Prashad, Har, Bharat Heavy Electricals Ltd., India; International Journal of COMADEM; July 2001; ISSN 1363-7681; Volume 4, No. 3, pp. 5-12; In English; Copyright; Avail: Issuing Activity

This paper is a state-of-the-art analysis of bearings and lubricants in electrical environment and gives recent advances in the behaviour and response of rolling-element, hydrodynamically lubricated journal and thrust bearings, and lubricants under the influence of electric current. Recent papers mostly published after 1985 are referred to and these are taken from the author's contributions to various referred journals and proceedings of tribology.

Author

Lubricants; Tribology; Conferences; Electromagnetism

38

QUALITY ASSURANCE AND RELIABILITY

Includes approaches to, and methods for reliability analysis and control, inspection, maintainability, and standardization.

20010081062 National Inst. of Standards and Technology, Manufacturing Engineering Lab., Gaithersburg, MD USA

Porting a Complex Machine Tool Error Compensation System from Microsoft DOS to Microsoft Windows NT

Bandy, H. T.; Domez, M. A.; Welsch, L. A.; Jul. 2001; 18p; In English

Report No.(s): PB2001-107282; NISTIR-6753; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes the porting of a manufacturing quality control system from PC-type computers operating on Microsoft DOS, Microsoft Windows 95, and IBM OS/2, to updated PCs operating on Microsoft Windows NT. The changes included adapting the control software and input/output (I/O) card drivers from 16-bit requirements to 32-bit requirements. Real-time response was a critical issue. The programming environment was also changed to better integrate the modules and languages.

NTIS

Programming Environments; Machine Tools; Errors; Quality Control; Personal Computers

39

STRUCTURAL MECHANICS

Includes structural element design, analysis and testing; dynamic responses of structures; weight analysis; fatigue and other structural properties; and mechanical and thermal stresses in structure. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

20010077910 Oak Ridge National Lab., TN USA

Study of Fatigue and Fracture Behavior of Cr-Based Alloys and Intermetallic Materials: Effects of Processing on the Microstructure and Mechanical Behavior of Binary Cr-Ta Alloys

He, Y. H.; Lu, Y.; Wang, D. F.; Liaw, P. K.; Liu, C. T.; Jan. 18, 2001; 28p; In English

Report No.(s): DE2001-777677; No Copyright; Avail: Department of Energy Information Bridge

The microhardness and tensile and fracture-toughness properties of drop-cast and directionally-solidified Cr-9.25 atomic percent Ta alloys have been investigated. Directional solidification was found to soften the alloy which could be related to the development of equilibrium and aligned microstructures. It was observed that the tensile properties of the Cr-Ta alloys at room and elevated temperatures could be improved by obtaining aligned microstructures. The directionally-solidified alloy also showed increased fracture toughness at room temperature. This trend is mainly associated with crack deflection and the formation of shear ribs in the samples with aligned microstructures. The sample with better-aligned lamellar exhibits greater fracture toughness.

NTIS

Fracture Mechanics; Fatigue (Materials); Intermetallics; Binary Alloys; Microstructure; Tensile Properties; Microhardness

20010078914 NASA Marshall Space Flight Center, Huntsville, AL USA

Structural Analysis of a 50 cm Diameter Open-Back Triangular Cell Beryllium Mirror in a Cryogenic Environment

Craig, Larry, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; MSFC Technology Days, 9-10 May 2001, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

This paper discusses NASTRAN structural analysis of the Sub-Scale Beryllium Mirror Demonstrator (SBMD), which has been developed by Ball Aerospace as an experimental design concept for the Next Generation Space Telescope (NGST). The mirror was repeatedly subjected to 35K environment in the large cryogenic test chamber at Marshall Space Flight Center (MSFC). Deformations on the mirror surface were measured optically. The surface distortions predicted by NASTRAN are analyzed optically for comparison with the measured values. Model results compare favorably with measured results for an ambient temperature validation case. For the cryogenic environment case the influence of geometry and material property variations is being investigated to obtain closer correlation.

Author

Mirrors; Beryllium; Cryogenics; Structural Analysis; Surface Distortion; Deformation

20010080468 NASA Langley Research Center, Hampton, VA USA

Numerical Simulation of Delamination Growth in Composite Materials

Camanho, P. P., Porto Univ., Portugal; Davila, C. G., NASA Langley Research Center, USA; Ambur, D. R., NASA Langley Research Center, USA; August 2001; 24p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 707-85-10-01

Report No.(s): NASA/TP-2001-211041; L-18101; NAS 1.60:211041; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The use of decohesion elements for the simulation of delamination in composite materials is reviewed. The test methods available to measure the interfacial fracture toughness used in the formulation of decohesion elements are described initially. After a brief presentation of the virtual crack closure technique, the technique most widely used to simulate delamination growth, the formulation of interfacial decohesion elements is described. Problems related with decohesion element constitutive equations, mixed-mode crack growth, element numerical integration and solution procedures are discussed. Based on these investigations, it is concluded that the use of interfacial decohesion elements is a promising technique that avoids the need for a pre-existing crack and pre-defined crack paths, and that these elements can be used to simulate both delamination onset and growth.

Author

Delaminating; Composite Materials; Fracture Strength; Numerical Integration; Simulation

42

GEOSCIENCES (GENERAL)

Includes general research topics related to the Earth sciences, and the specific areas of petrology, mineralogy, and general geology. For other specific topics in geosciences see categories 41 through 48.

20010077971 Rocky Mountain Research Station, Ogden, UT USA

Watershed Management Contributions to Land Stewardship: A Literature Review

Baker, M. B.; Folliott, P. F.; Edminster, C. B.; Mora, K. L.; Dillon, M. C.; Dec. 2000; 68p; In English; Original contains color illustrations

Report No.(s): PB2001-107155; RMRS-GTR-71WWW; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

An international conference to increase people's awareness of the contributions that watershed management can make to future land stewardship was held in Tucson, Arizona, March 13-16, 2000. This bibliography is a compilation of the synthesis and poster papers presented at the conference along with the literature cited in these papers on watershed research projects, applied watershed management activities, and technology transfer mechanisms. This publication furnishes a literature basis for researchers, managers, decision-makers, educators, students, and lay persons with a keen interest in watershed management and better land stewardship in the future.

NTIS

Watersheds; Ecosystems; Resources Management; Bibliographies; Management Systems

20010077975 Geological Survey, Water Resources Div., Sacramento, CA USA

Water Resources Data for California Water Year 2000, Volume 3, Southern Central Valley Basins and the Great Basin from Walker River to Truckee River Annual Report, 1 Oct. 1999 - 30 Sep. 2000

Anderson, S. W.; Smithson, J. R.; Freeman, L. A.; Rockwell, G. L.; May 2001; 500p; In English

Report No.(s): PB2001-106913; USGS/WDR/CA-00/3-Vol-3; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche

Water-resources data for the 2000 water year for California consist of records of stage, discharge, and water quality of streams, stage and contents in lakes and reservoirs, and water levels and water quality in wells. Volume 3 contains discharge records for 175 gaging stations, stage and contents for 44 lakes and reservoirs, and water quality for 31 stations. Also included are 1 crest-stage partial-record station and 1 miscellaneous partial-record sites. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California.

NTIS

California; Water Resources; Hydrology; Ground Water; Surface Water; Data Systems

20010078199 Geological Survey, Water Resources Div., Sacramento, CA USA

Water Resources Data for California Water Year 2000, Volume 2, Pacific Slope Basins from Arroyo Grande to Oregon State Line except Central Valley Annual Report, 1 Oct. 1999 - 30 Sep. 2000

Webster, M. D.; Anderson, S. W.; Friebel, M. F.; Freeman, L. A.; Smithson, J. R.; May 2001; 416p; In English

Report No.(s): PB2001-106912; USGS/WDR/CA-00/2-Vol-2; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche

Water-resources data for the 2000 water year for California consist of records of stage, discharge, and water quality of streams, stage and contents in lakes and reservoirs, and water levels and water quality in wells. Volume 2 contains discharge records for 121 gaging stations, gage-height records for 10 stations, stage and contents for 6 lakes and reservoirs, and water quality for 34 stations. Also included are data for 1 low-flow partial-record station, and 32 miscellaneous-measurement stations. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California.

NTIS

California; Water Resources; Hydrology; Surface Water; Streams

20010078200 Geological Survey, Water Resources Div., Sacramento, CA USA

Water Resources Data for California Water Year 2000, Volume 4, Northern Central Valley Basins and the Great Basin from Honey Lake Basin to the Oregon State Line Annual Report, 1 Oct. 1999 - 30 Sep. 2000

Anderson, S. W.; Rockwell, G. L.; Smithson, J. R.; Friebel, M. F.; Webster, M. D.; May 2001; 444p; In English

Report No.(s): PB2001-106911; USGS/WDR/CA-00/4-Vol-4; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche

Water-resources data for the 2000 water year for California consist of records of stage, discharge, and water quality of streams, stage and contents in lakes and reservoirs, and water levels and water quality in wells. Volume 4 contains discharge records for 190 gaging stations and 5 partial-record stations, stage and contents for 60 lakes and reservoirs, gage-height records for 1 station, precipitation data for 3 stations, and water quality for 10 stations. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in California.

NTIS

Water Resources; California; Hydrology; Surface Water

20010078203 Bureau of Reclamation, Water Quality and Land Suitability Group, Denver, CO USA

Burnt River Basin Water Temperature Modeling Study Final Report

Mangelson, K. A.; Apr. 2001; 570p; In English

Report No.(s): PB2001-106545; No Copyright; Avail: CASI; A24, Hardcopy; A04, Microfiche

This report presents the details of a water quality study focusing on instream water temperatures in the Burnt River basin of eastern Oregon. This basin was also selected to use to eventually develop an agricultural water quality management are (SV 1010) plan. This report presents summaries and graphs of the field data obtained for this study. Also, this report presents the development and use of a calibrated stream temperature model.

NTIS

River Basins; Water Temperature; Models; Water Resources; Hydrology; Streams

20010078962 NASA Goddard Space Flight Center, Greenbelt, MD USA

Visions of Our Planet's Atmosphere, Land and Oceans Electronic-Theater 2001

Hasler, A. F., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; Digital Earth 2001 Conference, 25 Jun. 2001, Fredericton, Canada; Sponsored by NASA, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The NASA/NOAA/AMS Electronic Theater presents Earth science observations and visualizations in a historical perspective. Fly in from outer space to Fredericton New Brunswick. Drop in on the Kennedy Space Center and Park City Utah, site of the 2002 Olympics using 1 m IKONOS "Spy Satellite" data. Go back to the early weather satellite images from the 1960s and see them contrasted with the latest US and International global satellite weather movies including hurricanes & tornadoes. See the latest spectacular images from NASA/NOAA and Canadian remote sensing missions like Terra GOES, TRMM, SeaWiFS, LANDSAT 7, and Radarsat that are visualized & explained. See how High Definition Television (HDTV) is revolutionizing the way we communicate science in cooperation with the American Museum of Natural History in NYC. See dust storms in Africa and smoke plumes from fires in Mexico. See visualizations featured on Newsweek, TIME, National Geographic, Popular Science covers & National & International Network TV. New visualization tools allow us to roam & zoom through massive global images eg LANDSAT tours of the US, Africa, & New Zealand showing desert and mountain geology as well as seasonal changes in vegetation. See animations of the polar ice packs and the motion of gigantic Antarctic Icebergs from SeaWinds data. Spectacular new visualizations of the global atmosphere & oceans are shown. See massive dust storms sweeping across Africa. See vortexes and currents in the global oceans that bring up the nutrients to feed tiny plankton and draw the fish, whales and fisherman. See the how the ocean blooms in response to these currents and El Nino/La Nina climate changes. The demonstration is interactively driven by a SGI Onyx II Graphics Supercomputer with four CPUs, 8 Gigabytes of RAM and Terabyte of disk. With multiple projectors on a giant screen. See the city lights, fishing fleets, gas flares and bio-mass burning of the Earth at night observed by the "night-vision" DMSP military satellite.

Author

Remote Sensing; Video Communication; Meteorological Satellites; Earth Sciences

20010079692 North Carolina State Univ., Water Resources Research Inst., Raleigh, NC USA

Examination of the Wetland Hydrologic Criterion and Its Application in the Determination of Wetland Hydrologic Status

Hunt, W. F.; Skaggs, R. W.; Chescheir, G. M.; Amatya, D. M.; Jun. 2001; 148p; In English

Report No.(s): PB2001-106531; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Wetland hydrology is the most basic characteristic of wetlands. Without it hydric soils would not develop and hydrophytic vegetation could not be sustained. Controversy surrounds wetland hydrology, however, which may be summarized in two critical questions: (1) What method can be used to determine whether a given criterion is satisfied on a particular site; and (2) What criterion or set of criteria define wetland hydrology. This report examines both questions. The Threshold Wetland Simulation (TWS) method was developed to determine whether or not the wetland hydrologic criterion is met on a given site. The method compares the hydroperiod of a simulated wetland that just barely satisfied the hydrologic criterion with the hydroperiod of an actual given site. The TWS method was tested on thousands of computer simulated site-years of data and hundreds of field site-years of data. The wetness of sites varied over a continuum ranging from known uplands to known wetlands. The TWS method correctly assessed the hydrologic status of over 90% of site-years tested. It was concluded that the TWS method is a reliable and efficient method of assessing whether or not the wetland hydrologic criterion is met at a given site for given conditions.

NTIS

Computerized Simulation; Hydrology; Wetlands; Ground Water

20010079783 Geological Survey, IA USA

Simulated Ground-Water Flow and Water Quality of the Mississippi River Alluvium near Burlington, Iowa, 1999 Final Report

Boyd, R. A.; 2001; 58p; In English

Report No.(s): PB2001-106557; USGS/WRI-00-4274; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The City of Burlington, Iowa, obtains some of its public water supply by withdrawing ground water from the Mississippi River alluvium, an alluvial aquifer adjacent to the Mississippi River. The U.S. Geological Survey, in cooperation with the City of Burlington, conducted a hydrologic study of the Mississippi River alluvium near Burlington in 1999 to improve understanding of the flow system, evaluate the effect of hypothetical pumping scenarios on the flow system, and evaluate selected water-quality constituents in parts of the alluvium.

NTIS

Mississippi River (US); Ground Water; Aquifers; Water Quality; Hydrology; Surface Water

20010079947 Geological Survey, Tucson, AZ USA

Structural Controls on Ground-Water Conditions and Estimated Aquifer Properties near Bill Williams Mountain, Williams, Arizona Final Report

Pierce, H. A.; 2001; 54p; In English

Report No.(s): PB2001-106556; USGS/WRI-01-4058; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Currently all the water used by the City of Williams is supplied by surface runoff. During 1996 and 1999, reservoirs reached historically low levels. Understanding the ground-water flow system is critical to managing the ground-water resources in this part of the Coconino Plateau. The nearly 1,000-meter-deep regional aquifer in the Redwall and Muav Limestones, however, makes studying or utilizing the resource difficult. Near-vertical faults and complex geologic structures control the ground-water flow system on the southwest side of the Kaibab Uplift near Williams, Arizona. To address the hydrogeologic complexities in the study area, a suite of techniques, which included aeromagnetic, gravity, square-array resistivity, and audio-magnetotelluric surveys, were applied as part of a regional study near Bill Williams Mountain. Existing well data and interpreted geophysical data were compiled and used to estimate depths to the water table and to prepare a potentiometric map.

NTIS

Structural Properties (Geology); Water Resources; Aquifers; Ground Water; Surface Water

20010079948 Geological Survey, Lincoln, NE USA

Hydrogeology and Water Quality of Five Principal Aquifers in the Lower Platte South Natural Resources District, Eastern Nebraska, 1994 Final Report

Druliner, A. D.; Mason, J. P.; 2001; 56p; In English

Report No.(s): PB2001-106555; USGS/WRI-00-4155; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The U.S. Geological Survey, in cooperation with the Lower Platte South Natural Resources District, conducted a hydrogeologic and water-quality reconnaissance study of the five principal aquifers in deposits of Quaternary age in the Natural Resources District. The purpose of the study was to delineate the approximate extent of the aquifers, to estimate volumes of drainable water in three aquifers, to provide information that could be useful in designing future ground-water-quality monitoring, and to determine baseline water-quality conditions in the aquifers, focusing on nitrate concentrations.

NTIS

Hydrogeology; Water Quality; Aquifers; Ground Water; Geological Surveys

20010079949 Geological Survey, Reston, VA USA

Validation of a Numerical Modeling Method for Simulating Rainfall-Runoff Relations for Headwater Basins in Western King and Snohomish Counties, Washington

Dinicola, R. S.; 2000; 176p; In English

Report No.(s): PB2001-106550; USGS/WATER-SUPPLY PAPER-2495; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The validity of a method to simulate pre- and post-urbanization rainfall-runoff relations for headwater basins in western King and Snohomish Counties was assessed. It was intended that additional numerical models constructed with this method, along with existing physiographic, land-use, and climate data, could help mitigate urbanization effects in drainage basins throughout the region. This report documents an assessment of the validity of four primary components of the numerical modeling method: the conceptual model, the Hydrologic Simulation Program-FORTRAN (HSPF) program, the approach used to construct numerical models, and the 12 sets of precalibrated, or generalized, HSPF parameter values determined in a previous investigation.

NTIS

Applications Programs (Computers); Mathematical Models; Rain; Structural Basins; Hydrology Models

43

EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth features, phenomena and resources by aircraft, balloon, rocket, and spacecraft; analysis or remote sensing data and imagery; development of remote sensing products; photogrammetry; and aerial photographs. For instrumentation see 35 Instrumentation and Photography.

20010078965 NASA Marshall Space Flight Center, Huntsville, AL USA

TRMM Observations of Convective Regimes in the Amazon

Petersen, W. A., NASA Marshall Space Flight Center, USA; Nesbitt, S. W., NASA Marshall Space Flight Center, USA; Blakeslee,

Robert J., NASA Marshall Space Flight Center, USA; Hein, P., NASA Marshall Space Flight Center, USA; Cifelli, R., NASA Marshall Space Flight Center, USA; Rutledge, S. A., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

This study utilizes TRMM satellite precipitation radar, lightning imaging sensor, and passive microwave imager data together with ground-based lightning data to investigate the vertical structure, lightning, and rainfall characteristics of Amazonian and central South American convection for three separate wet-seasons. These characteristics are partitioned as a function of 850 mb zonal wind direction, motivated by observations collected during the six-week TRMM-LBA field campaign. The TRMM-LBA field campaign observations suggest that systematic variations in Amazonian convective vertical structure, lightning, and rainfall are all linked to bimodal variations in the low-level zonal wind (e.g., easterly and westerly regimes). The more spatially and temporally comprehensive TRMM dataset used in this study extends the TRMM-LBA observations by examining regime variability in Amazonian and South American convective structure over a continental scale domain. On a continental-scale, patterns of east and west regime 850 mb winds combined with LIS lightning flash densities suggest the presence of synoptic-scale controls (e.g., intrusion of extratropical frontal systems and interaction with the SACZ) on regional-scale variability in convective vertical structure. TRMM PR, TMI and ground-based lightning data suggest that regional variability in wet-season convective structure is most evident over the southern Amazon, Mato Grosso, Altiplano, southern Brazil, and eastern coastal regions of central and southern South America. Convective vertical structure, rain fall rates, and lightning activity are all more pronounced during easterly (westerly) regimes over the southern Amazon and Mato Grosso (Altiplano, and southern Brazil). Importantly, when considered with case-study results from TRMM-LBA, the systematic differences in convective structure that occur as a function of regime suggest that associated regime-differences may exist in the vertical distribution of diabatic heating. Hence the discrimination of convective vertical structure "regimes" over parts of the Amazon and vicinity based on a resolved variable such as the 850 mb zonal wind direction, while far from being perfect, may have important applications to the problems of cumulus parameterization, rainfall estimation and retrievals of latent heating over the Amazon.

Author

Trmm Satellite; Convection; Heat Transfer; Imaging Techniques; Lightning; Meteorological Radar; Precipitation (Meteorology); Wind (Meteorology)

20010079109 NASA Goddard Space Flight Center, Greenbelt, MD USA

Earth Remote Sensing: A Column Closure Approach

Tsay, Si-Chee, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; Cloud-Aerosol Workshop, 16-20 Jul. 2001, Chung-Li, Taiwan, Province of China; No Copyright; Avail: Issuing Activity; Abstract Only

Entering the new millennium, there is no doubt that scientists expand greatly their scientific knowledge of the Earth system by utilizing unique capabilities from the vantage points of space. These global satellite observations include the NASA/NOAA Pathfinder and other ongoing data analysis projects, the Earth Observing System (EOS) program, the Earth System Science Pathfinders (ESSP) small research satellite missions, multi-agency planning for the National Polar-orbiting Operational Environmental Satellite (NPOESS), and other international satellite missions. However, using satellite remotely sensed data alone cannot explore fully the physical processes and energetic balance involved in our changing climate. to close the loop, the ground-based remote sensing and airborne in situ measurements are required. This talk provides an overview of the general strategy of Earth remote sensing for a column closure approach and discusses necessary instrumentation.

Author

Remote Sensing; Satellite Observation

20010079946 North Central Forest Experiment Station, Saint Paul, MN USA

Forest Inventory and Analysis Database: Database Description and Users Manual Version 1.0

Miles, P. D.; Brand, G. J.; Alerich, C. L.; Bednar, L. F.; Woudenberg, S. W.; May 01, 2001; 138p
Report No.(s): PB2001-106560; FSGTR-NC-218; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Describes the structure of the Forest Inventory and Analysis Database (FIADB) and provides information on generating estimates of forest statistics from these data. The FIADB structure provides a consistent framework for storing forest inventory data across all ownerships across the entire USA. These data are available to the public.

NTIS

Inventories; Data Bases; User Manuals (Computer Programs); Forest Management

20010081590 Helsinki Univ. of Technology, Lab. of Space Technology, Espoo, Finland

Laboratory of Space Technology Annual Report 1999

Hallikainen, M.; Jun. 2000; 74p; In English

Report No.(s): PB2001-105999; Rept-42; Copyright; Avail: National Technical Information Service (NTIS)

The activities of the Laboratory of Space Technology in 1999 are described. The Laboratory is responsible for teaching Space Technology at the University. Two Master of Science in Technology degrees, two Licentiate of Science in Technology degree and one Doctor of Science in Technology degree in Space Technology were awarded in 1999. The main area in research was spaceborne and airborne remote sensing, including instrumentation, data collection and development of geophysical inversion algorithms. Several projects were funded by the European Commission and European Space Agency. The Laboratory's Skyvan research aircraft was operated in various research projects. The main emphasis is instrument development was in interferometric and polarimetric microwave radiometer techniques. The main applications were forest inventory, snow mapping, sea ice research, water quality monitoring, and atmospheric research.

NTIS

Aerospace Engineering; Remote Sensing; Aerial Reconnaissance

44

ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; and solar, geothermal, windpower, and waterwave conversion systems; energy storage; and traditional power generators. For technologies related to nuclear energy production see 73 Nuclear Physics. For related information see also 07 Aircraft Propulsion and Power; 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.

20010077909 Sandia National Labs., Albuquerque, NM USA

Fundamental Understanding and Development of Low-Cost, High-Efficiency Silicon Solar Cells Final Report, Sep. 1999 - Jun. 2000

Rohatgi, A.; Ebong, A.; Yelundur, V.; Hilali, M.; Jeong, J.; Feb. 2001; 280p; In English

Report No.(s): DE2001-780291; SAND2001-0230; No Copyright; Avail: Department of Energy Information Bridge

The overall objectives of this program are (1) to develop rapid and low-cost processes for manufacturing that can improve yield, throughput, and performance of silicon photovoltaic devices, (2) to design and fabricate high-efficiency solar cells on promising low-cost materials, and (3) to improve the fundamental understanding of advanced photovoltaic devices. Several rapid and potentially low-cost technologies are described in this report that were developed and applied toward the fabrication of high-efficiency silicon solar cells.

NTIS

Solar Cells; Silicon

20010078209 Oak Ridge National Lab., TN USA

IEA Bioenergy: Task 17. Short-Rotation Crops for Bioenergy. Proceedings of the Meeting of IEA, Bioenergy (3rd), Task 17

Christersson, L.; Wright, L.; 2001; 102p; In English; 3rd, 6-9 Sep. 1999, Auburn, AL, USA; Sponsored by International Energy Agency Coal Research, Unknown; Original contains color illustrations

Report No.(s): DE2001-777635; ORNL/TM-2000/311; No Copyright; Avail: Department of Energy Information Bridge

These proceedings are the results of the third meeting of Task 17 (Short-Rotation Crops for Bioenergy) within the framework of International Energy Agency (IEA), Bioenergy. The meeting was held in Auburn, Alabama, USA, September 6-9, 1999. The objectives of Task 17 support the goals of member countries for bioenergy production and use. These objectives are as follows: to stimulate the full-scale implementation of energy crops in the participating countries; to strengthen the contacts and cooperation between participating countries, scientists, biomass producers, machine developers, entrepreneurs, and end users to select the most urgent research and development areas and suggest projects of co-operation; to inform Ex-Co-members; and to deliver proceedings from the meetings.

NTIS

Conferences; Farm Crops; Rotation; Energy Conversion; Energy Consumption

20010080467 NASA Ames Research Center, Moffett Field, CA USA

Large-Scale Wind Turbine Testing in the NASA 24.4m (80) by 36.6m(120) Wind Tunnel

Zell, Peter T., NASA Ames Research Center, USA; May 03, 2000; 1p; In English; Subsonic Aerodynamic Testing Association

Meeting, 5-9 Jun. 2000, Stuttgart, Germany; No Copyright; Avail: Issuing Activity; Abstract Only

The 80- by 120-Foot Wind Tunnel at NASA Ames Research Center in California provides a unique capability to test large-scale wind turbines under controlled conditions. This special capability is now available for domestic and foreign entities wishing to test large-scale wind turbines. The presentation will focus on facility capabilities to perform wind turbine tests and typical research objectives for this type of testing.

Author

Wind Turbines; Wind Tunnel Tests

45

ENVIRONMENT POLLUTION

Includes atmospheric, water, soil, noise, and thermal pollution.

20010077973 CONSOL Energy, Inc., Research and Development, South Park, PA USA

Flue Gas SO₃ Reduction Final Report, 1 Aug. 1999 - 31 Aug. 2000

Brandes, S. D.; Devito, M. S.; McCoy, D. C.; Jun. 20, 2001; 62p; In English; Original contains color illustrations

Report No.(s): PB2001-107146; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The effectiveness of solid alkalai sorbents for the removal of SO₃ from coal-combustion flue gas was demonstrated. The project objectives were to determine which of three types of solid sorbent, calcitic limestone, dolomitic limestone or magnesium hydroxide, would be most effective for removal of flue gas SO₃. In pilot scale tests, the dolomitic limestone was found to be superior to the calcitic limestone at the same process conditions. However, bench scale tests using Mg(OH)₂ combined with results from pilot scale combustor tests using dolomitic and calcitic limestones indicate that, at the mole ratios of calcitic limestone or dolomitic limestone to SO₃ required to achieve significant SO₃ removals (>50%), Mg(OH)₂ would be a superior sorbent. An economic analysis of the process shows that the use of Mg(OH)₂, even though it is a more expensive sorbent, would be economically advantageous over the two limestones. The economics of using pulverized calcitic limestone and pulverized dolomitic limestone injection were compared to the use of magnesium hydroxide (Mg(OH)₂) slurry for reduction of flue gas SO₃ levels.

NTIS

Sulfur Oxides; Air Pollution; Pollution Control; Flue Gases; Combustion

20010077974 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA

Quality Assurance Guidance Document: Quality Assurance Project Plan for the Air Toxics Monitoring Program

Jun. 2001; 198p; In English; Original contains color illustrations

Report No.(s): PB2001-107142; EPA/454/R-01/007; No Copyright; Avail: National Technical Information Service (NTIS)

EPA policy requires that all projects involving the generation, acquisition, and use of environmental data be planned and documented and have an Agency-approved quality assurance project plan or QAPP prior to the start of data collection. The primary purpose of the QAPP is to provide an overview of the project, describe the need for the measurements, and define QA/QC activities to be applied to the project, all within a single document. The QAPP should be detailed enough to provide a clear description of every aspect of the project and include information for every member of the project staff, including site operators, lab staff, and data reviewers. The QAPP facilitates communication among clients, data users, project staff, management, and external reviewers. Effective implementation of the QAPP assists project managers in keeping projects on schedule and within the resource budget. Agency QA policy is described in the Quality Manual and EPA QA/R-1, EPA Quality System Requirements for Environmental Programs. The following document represents a draft model Quality Assurance Project Plan (QAPP) for the environmental data operations for Air Toxics Monitoring Program (ATMP). The Office of Air Quality Planning and Standards (OAQPS) staff developed this Model QAPP to serve as an example of the type of information and detail necessary for the documents that will be submitted by state and local organizations involved in their ATMP. Please review this document and forward your comments and suggestions to the persons listed in the Acknowledgment Section. This draft model QAPP was generated using the EPA QA regulations and guidance as described in EPA QA/R-5, EPA Requirements for Quality Assurance Project Plans and the accompanying document, EPA QA/G-5, Guidance for Quality Assurance Project Plans. All pertinent elements of the QAPP regulations and guidance are addressed in this model.

NTIS

Toxicology; Air Pollution; Quality Control; Environmental Monitoring; Data Acquisition; Contaminants

20010078049 NASA Goddard Inst. for Space Studies, New York, NY USA

Chemistry-Climate Interactions in the GISS GCM, Part 1, Tropospheric Chemistry Model Description and Evaluation

Shindell, Drew T., NASA Goddard Inst. for Space Studies, USA; Grenfell, J. Lee, NASA Goddard Inst. for Space Studies, USA; Rind, David, NASA Goddard Inst. for Space Studies, USA; Price, Colin, Tel-Aviv Univ., Ramat-Aviv, Israel; Grewe, Volker, Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Jun. 01, 2001; 76p; In English; Original contains color illustrations

Report No.(s): GCN-01-14; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A tropospheric chemistry module has been developed for use within the Goddard Institute for Space Studies (GISS) general circulation model (GCM) to study interactions between chemistry and climate change. The model uses a simplified chemistry scheme based on CO-NO_x-CH₄ chemistry, and also includes a parameterization for emissions of isoprene, the most important non-methane hydrocarbon. The model reproduces present day annual cycles and mean distributions of key trace gases fairly well, based on extensive comparisons with available observations. Examining the simulated change between present day and pre-industrial conditions, we find that the model has a similar response to that seen in other simulations. It shows a 45% increase in the global tropospheric ozone burden, within the 25% - 57% range seen in other studies. Annual average zonal mean ozone increases by more than 125% at Northern Hemisphere middle latitudes near the surface. Comparison of model runs that allow the calculated ozone to interact with the GCM's radiation and meteorology with those that do not shows only minor differences for ozone. The common usage of ozone fields that are not calculated interactively seems to be adequate to simulate both the present day and the pre-industrial ozone distributions. However, use of coupled chemistry does alter the change in tropospheric oxidation capacity, enlarging the overall decrease in OH concentrations from the pre-industrial to the present by about 10% (-5.3% global annual average in uncoupled mode, -5.9% in coupled mode). This indicates that there may be systematic biases in the simulation of the pre-industrial to present day decrease in the oxidation capacity of the troposphere (though a 10% difference is well within the total uncertainty). Global annual average radiative forcing from pre-industrial to present day ozone change is 0.32 W/sq m. The forcing seems to be increased by about 10% when the chemistry is coupled to the GCM. Forcing values greater than 0.8 W/sq m are seen over large areas of the United States, Southern Europe, North Africa, the Middle East, Central Asia, and the Arctic. Radiative forcing is greater than 1.5 W/sq m over parts of these areas during Northern summer. Though there are local differences, the radiative forcing is overall in good agreement with the results of other modeling studies in both its magnitude and spatial distribution, demonstrating that the simplified chemistry is adequate for climate studies.

Author

Atmospheric Chemistry; Atmospheric General Circulation Models; Climate Change; Ozone; Troposphere

20010078250 California Energy Commission, Sacramento, CA USA

California Energy Commission: 1999 Electricity Generation Emissions Report. A Report to the Legislature as directed by SB 1305 (Statutes of 1997)

Jul. 1999; 58p; In English; Original contains color illustrations

Report No.(s): PB2001-107537; P300-99-005; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report reviews the activities of the past two years related to electricity industry restructuring and generation emissions and describes future activities which are important to ensuring continued effective management of electricity generation emissions. This report finds that air quality regulators can use the existing air quality regulatory framework to respond to ongoing and proposed structural and regulatory changes in the electricity industry. Current and future air quality permitting, rulemaking, and planning activities within that framework should take into account the changes occurring within the electricity industry to ensure emissions reductions are achieved as efficiently as practicable. Despite continued growth of the state's population and economy, air quality is improving throughout California.

NTIS

Electricity; Law (Jurisprudence); Air Pollution; Emission

20010078890 San Jose State Univ., Moffett Field, CA USA

Numerical Modeling of Transport of Biomass Burning Emissions on South America Final Report

RibeirodeFreitas, Saulo, San Jose State Univ., USA; Aug. 03, 2001; 13p; In English

Contract(s)/Grant(s): NCC2-5353; 21-1505-2262; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Our research efforts have addressed theoretical and numerical modeling of sources emissions and transport processes of trace

gases and aerosols emitted by biomass burning on the central of Brazil and Amazon basin. For this effort we coupled all Eulerian transport model with the mesoscale atmospheric model RAMS (Regional Atmospheric Modeling System).

Author

Biomass Burning; Mathematical Models; Mesoscale Phenomena; Amazon Region (South America); Aerosols; Atmospheric Composition

20010078968 NASA Goddard Inst. for Space Studies, New York, NY USA

Contribution of Changing Sources and Sinks to the Growth Rate of Atmospheric Methane Concentrations for the Last Two Decades

Matthews, Elaine, NASA Goddard Inst. for Space Studies, USA; Walter, B., Columbia Univ., USA; Bogner, J., Landfills+, Inc., USA; Sarma, D., New York Univ., USA; Portmeyer, G., Arizona Univ., USA; [2001]; 1p; In English; CNES International Workshop on Emissions..., 19-22 Jun. 2001, Paris, France; No Copyright; Avail: Issuing Activity; Abstract Only

In situ measurements of atmospheric methane concentrations begun in the early 1980s show decadal trends, as well as large interannual variations, in growth rate. Recent research indicates that while wetlands can explain several of the large growth anomalies for individual years, the decadal trend may be the combined effect of increasing sinks, due to increases in tropospheric OH, and stabilizing sources. We discuss new 20-year histories of annual, global source strengths for all major methane sources, i.e., natural wetlands, rice cultivation, ruminant animals, landfills, fossil fuels, and biomass burning. We also present estimates of the temporal pattern of the sink required to reconcile these sources and atmospheric concentrations over this time period. Analysis of the individual emission sources, together with model-derived estimates of the OH sink strength, indicates that the growth rate of atmospheric methane observed over the last 20 years can only be explained by a combination of changes in source emissions and an increasing tropospheric sink. Direct validation of the global sources and the terrestrial sink is not straightforward, in part because some sources/sinks are relatively small and diffuse (e.g., landfills and soil consumption), as well as because the atmospheric record integrates multiple and substantial sources and tropospheric sinks in regions such as the tropics. We discuss ways to develop and test criteria for rejecting and/or accepting a suite of scenarios for the methane budget.

Author

Methane; Troposphere; Air Pollution; Atmospheric Composition

20010078969 NASA Goddard Space Flight Center, Greenbelt, MD USA

Background Maritime Aerosol: Their Optical Thickness and Scattering Properties

Kaufman, Yoram J., NASA Goddard Space Flight Center, USA; Smirnov, Alexander, Science Systems and Applications, Inc., USA; Holben, Brent N., NASA Goddard Space Flight Center, USA; Dubovik, Oleg, Science Systems and Applications, Inc., USA; [2001]; 1p; In English; IAMAS, 10-18 Jul. 2001, Innsbruck, Austria; No Copyright; Avail: Issuing Activity; Abstract Only

The effect of human induced change in the aerosol concentration and properties, or the aerosol response to climate change (e.g. droughts producing fires or dust) should be measured relative to a "background aerosol". How to define this background aerosol, so that it is both measurable and useful? Here we use 10 stations located in the Pacific, Atlantic and Indian Oceans to answer this question. Using a data set of the spectral optical thickness measured by the Aerosol Robotic network (AERONET), extending 1-3 years, we find the background conditions for these stations. The oceanic background aerosol is the result of ocean emission and spray, and some residual long lived continental aerosol. Its source is very broadly spread and is expected to vary little in time. Pollution or dust sources are from specific locations, emitted and transported to the measuring site in specific combination of meteorological conditions. Therefore they are expected to vary with time. It follows that the background aerosol can be identified as the median for conditions with small variations. To define the background we compute the median of N consequent measurements. We use N=50 that in average cloudy conditions corresponds to 2-3 days of measurements and N=100 (4-5 days). Most high polluted or dusty conditions correspond to data sequences with high standard deviation (greater than 0.02 in optical thickness) and are excluded. From the remaining N point running medians with low standard deviations we derive again the median. This excludes those rare cases of pollution or dust that is stable during the N measurements. The results show that the background aerosol over the Pacific Ocean is characterized by optical thickness of 0.055 at 500 nm and Angstrom exponent of 0.74. Over the Atlantic Ocean the values are 0.070 and 1.1 respectively, with little influence of the assumed value of N (50 or 100). The derivation of the background uses 20,000 and 5000 medians respectively that passed the criteria. The contribution of coarse and fine aerosol to the background aerosol is also calculated.

Author

Aerosols; Optical Thickness; Scattering; Oceanography

20010078974 NASA Goddard Space Flight Center, Greenbelt, MD USA

DAO's Next Generation Physical-Space/Finite-Volume Data Assimilation System: Formulation and Initial Evaluation

daSilva, A., NASA Goddard Space Flight Center, USA; Lin. S.-J., NASA Goddard Space Flight Center, USA; Dee, D., NASA Goddard Space Flight Center, USA; Joiner, J., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; AMS NWP Conference, 30 Jul. - 2 Aug. 2001, Fort Lauderdale, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Physical-space/Finite-volume Data Assimilation System (fvDAS) is the next generation global atmospheric data assimilation system in development at the Data Assimilation Office at NASA's Goddard Space Flight Center. It is based on a new finite-volume general circulation model jointly developed by NASA and NCAR, and on the Physical-Space Statistical Analysis System (PSAS) developed at the DAO. In this talk we will describe the general system formulation, the adaptive quality control and general aspects of the error covariance modeling. The NASA-NCAR GCM is a completely new model which replaces the CEOs GCM used in the previous GEOS-1/2/3 Data Assimilation systems. A particular configuration of adaptive Statistical Quality Control and the Physical-space Statistical Analysis System (PSAS) are currently implemented in DAO's operational Data Assimilation System. However, the unique finite-volume formulation of the NASA-NCAR GCM, combined with the generality of the observation-space formulation of PSAS, provides for a very simple and accurate model-analysis interface. The system assimilates a variety of conventional and satellite observations. In particular, TOVS Level 1B radiances are assimilated using a 1-D variational scheme, both in clear sky and cloudy conditions. Computationally, the fvDAS runs approximately 10 times faster than the operational GEOS-Terra system. We will show that the next-generation fvDAS has much improved observation-minus-6hr forecast (O-F) statistics, as well as 5-day forecast skills. Top of the atmosphere radiation fields are in closer agreement with CERES measurements, with realistic precipitation and moisture fields. We will also show that the finite-volume formulation of the fvDAS produce assimilated fields which are more suitable for driving constituent transport models.

Author

Atmospheric General Circulation Models; Data Systems; Meteorological Satellites; Finite Volume Method

20010079197 Office of Air Quality Planning and Standards, Research Triangle Park, NC USA

National Emission Standards for Hazardous Air Pollutants (NESHAP) for Integrated Iron and Steel Plants - Background Information for Proposed Standards, Final Report *Final Report*

Jan. 2001; 222p

Report No.(s): PB2001-107481; EPA-453/R-01-005; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This document summarizes the basic background information used in the development of MACT standards for the integrated iron and steel manufacturing source category. All references cited in this document are available in Docket No. A-2000-44. In addition, this document is supplemented by technical memoranda to the docket to document those steps in the standards development process not covered within this compilation of background information. The balance of chapter 1 summarizes the statutory basis for MACT standards and the selection of the source category. Chapter 2 provides an overview of the industry. Chapter 3 discusses the processes in detail and provides estimates of baseline emissions for each process. Emission control technologies and their performance are summarized in Chapter 4. Chapter 5 presents the determination of the MACT floor. Model plants are developed in Chapter 6 (for use in estimating potential impacts), and options for emission control and monitoring are discussed. Environmental and energy impacts are estimated for the model plants and for all plants nationwide in Chapter 7. The estimated costs for emission control and monitoring are given in Chapter 8. Appendix A summarizes the emissions data and Appendix B documents the information used to develop the MACT floor.

NTIS

Pollution Control; Exhaust Emission; Standards; Air Pollution; Industrial Plants

20010079695 Denver Univ., Dept. of Chemistry and Biochemistry, Denver, CO USA

On-Road Remote Sensing of Automobile Emissions in the Phoenix Area: Year 1

Bishop, G. A.; Pokharel, S. S.; Stedman, D. H.; Nov. 1999; 34p; In English

Contract(s)/Grant(s): CRC Proj. E-23-4

Report No.(s): PB2001-107178; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The University of Denver conducted a four-day remote sensing study in the Phoenix, Arizona area in the fall of 1998. The remote sensor used in this study is capable of measuring the ratios of carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NO) to carbon dioxide (CO₂) in motor vehicle exhaust. From these ratios, we calculate the percent concentrations of CO,

CO₂, HC and NO in motor vehicle exhaust which would be observed by a tailpipe probe, corrected for water and any excess oxygen not involved in combustion. The system used in this study was also configured to determine the speed and acceleration of the vehicle, and was accompanied by a video system to record the license plate of the vehicle.

NTIS

Remote Sensing; Measurement; Automobiles; Exhaust Emission

20010079696 Denver Univ., Dept. of Chemistry and Biochemistry, Denver, CO USA

On-Road Remote Sensing of Automobile Emissions in the Denver Area: Year 1

Popp, P. J.; Pokharel, S. S.; Bishop, G. A.; Stedman, D. H.; Dec. 1999; 26p; In English

Contract(s)/Grant(s): CRC Proj. E-23-4-99

Report No.(s): PB2001-107177; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The University of Denver conducted a four-day remote sensing study in the Denver area. The remote sensor used in this study is capable of measuring the ratios of carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NO) to carbon dioxide (CO₂) in motor vehicle exhaust. From these ratios, we calculate the percent concentrations of CO, CO₂, HC and NO in motor vehicle exhaust which would be observed by a tailpipe probe, corrected for water and any excess oxygen not involved in combustion. The system used in this study was also configured to determine the speed and acceleration of the vehicle, and was accompanied by a video system to record the license plate of the vehicle.

NTIS

Remote Sensing; Measurement; Automobiles; Exhaust Emission; Remote Sensors; Combustion

20010079697 Clean Air Vehicle Technology Center, Oakland, CA USA

Effect of Air Conditioning on Regulated Emissions for In-Use Vehicles, Phase 1 Final Report

Oct. 29, 1999; 30p; In English

Contract(s)/Grant(s): CRC Proj. E-37

Report No.(s): PB2001-107176; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Establishing reliable emissions inventories is central to identifying and evaluating new pollution control strategies as well as air quality modeling. The challenges associated with characterizing the emissions from mobile sources, in particular, have been daunting. Building models that can predict future emissions levels given the dynamic nature of transportation technology evolution, fleet composition changes, and user behavior is difficult and heavily dependent on timely data. The research project presented here was undertaken to better understand one specific aspect of this modeling challenge: how the use of air-conditioning (A/C) in light-duty vehicles affects vehicle emissions. This project involved conducting a series of emissions tests involving several different driving cycles, environmental conditions, and fuels. The result of this work is a database that relates how vehicle emissions and fuel economy are impacted by A/C use.

NTIS

Air Conditioning; Air Pollution; Air Quality; Exhaust Emission

20010079782 Geological Survey, Northborough, MA USA

Use of Thematic Mapper Imagery to Assess Water Quality, Trophic State, and Macrophyte Distributions in Massachusetts Lakes Final Report

Waldron, M. C.; Steeves, P. A.; Finn, J. T.; 2001; 50p; In English

Report No.(s): PB2001-106549; USGS-WRI-01-4016; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

During the spring and summer of 1996, 1997, and 1998, measurements of phytoplankton-chlorophyll concentration, Secchi disk transparency, and color were made at 97 Massachusetts lakes within 24 hours of LANDSAT Thematic Mapper imaging of the lakes in an effort to assess water quality and trophic state. Spatial distributions of floating, emergent, and submerged macrophytes were mapped in 49 of the lakes at least once during the 3-year period. The maps were digitized and used to assign pixels in the thematic mapper images to one of four vegetation cover classes-open water, 1-50 percent floating-and-emergent-vegetation cover, 51-100 percent floating-and-emergent-vegetation cover, and submerged vegetation at

any density. The field data were collected by teams of U.S. Geological Survey and Massachusetts Department of Environmental Management staff and by 76 volunteers.

NTIS

Thematic Mappers (LANDSAT); Lakes; Satellite Imagery; Image Analysis; Remote Sensing; Environment Management; Water Sampling; Massachusetts

20010079950 Hawaii Univ., Water Resources Research Center, Honolulu, HI USA

Innovative Approach to Assess and Monitor the Quality of Coastal Waters

Fujioka, R. S.; Rijal, G. K.; Bonilla, J. A.; Jun. 1998; 20p; In English

Report No.(s): PB2001-106541; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

As exploratory study was conducted under Sea Grant Mini-Grant Program to test the hypothesis that by implementing an innovative monitoring strategy of analyzing waters for three complementary tests, the combined test results can more reliably determine whether that environmental water is contaminated with point source pollution (sewage) or non-point source pollution (stream, storm drain). These three selected tests were used to analyze the quality of water sample obtained from streams, coastal waters used for swimming as well as shoreline, nearshore and offshore ocean sites near three of the ocean sewage outfalls (Waianae, Mokapu and Sand Island) operated by the City and County of Honolulu.

NTIS

Coastal Water; Contamination; Water Pollution; Pollution Monitoring

20010080476 NASA Ames Research Center, Moffett Field, CA USA

Mapping Distant Continental Influences in the Remote Pacific Atmosphere; Simulations of CO Relevant to the Photochemistry of Oxidants

Chatfield Robert B., NASA Ames Research Center, USA; Guo, Z., NASA Ames Research Center, USA; Sachse, G., NASA Ames Research Center, USA; Singh, H., NASA Ames Research Center, USA; Jun. 01, 2000; 1p; In English

Contract(s)/Grant(s): RTOP 622-61-10-10; No Copyright; Avail: Issuing Activity; Abstract Only

An animated sequence of maps of simulated carbon monoxide concentrations graphically portrays the extent of residual continental influence upon the tropical Pacific Ocean as studied by NASA aircraft during the PEM-Tropics B intensive sampling campaign. We used the MM5 at a 90 km resolution in a globally wrapped grid to simulate the meteorology of transport, and our GRACES model to follow the basic chemistry. The CO we simulate derives from different sources, and so we distinguish anthropogenic, natural terpenoid oxidation, biomass burning, and pervasive CH₄-oxidation influences. "Influence" is always judged with an implicit timescale, and these maps describe influence on the 15-45 day timescale appropriate for CO oxidation. In consequence, the maps are useful in assessing the origins of slowly reacting compounds like acetone, methanol, and the lightest hydrocarbons. At 8 km altitude, The Eastern South Pacific to ca. 130 W (eastern Polynesia) was frequently affected by continental influences but NASA's DC-8's flight path did not happen to take it into these regions very often. Near the surface, continentally influenced air crossed into the Western South Pacific, in the region northwest of the Southern Pacific Convergence Zone but south of the Intertropical Convergence Zone. This air originated from the NE Pacific, and partly from North America. Comparisons are made to CO and other compounds measured aboard the DC-8 and the P-3 aircraft. We will also use tracers to describe the influence of marine convection in the upper troposphere. As time allows, we will discuss the "age" of ozone within the very cleanest region sampled in portions of the near-equatorial Western South Pacific, using a simple chemical mechanism for ozone levels. These simulations describe the chemistry of an atmosphere with very low ozone.

Author

Carbon Monoxide; Oxidizers; Photochemical Reactions; Troposphere; Simulation; Pacific Ocean

20010082524 NASA Goddard Space Flight Center, Greenbelt, MD USA

Science Requirements Document for OMI-EOS, 2

Levelt, P. F., Royal Netherlands Meteorological Inst., Netherlands; vanderA, R., Royal Netherlands Meteorological Inst., Netherlands; Bhartia, P. K., NASA Goddard Space Flight Center, USA; Boersma, F., Royal Netherlands Meteorological Inst., Netherlands; Brinksma, E., Royal Netherlands Meteorological Inst., Netherlands; Carpay, J., Netherlands Agency for Aerospace Programs, Netherlands; Chance, K., Smithsonian Astrophysical Observatory, USA; deHaan, J., Royal Netherlands Meteorological Inst., Netherlands; Hilsenrath, E., NASA Goddard Space Flight Center, USA; Isaksen, I., Oslo Univ., Norway; Dec. 07, 2000; 194p; In English; Original contains color illustrations

Report No.(s): RS-OMIE-KNMI-001; KNMI-Publ-193; ISBN 90-369-2187-2; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

A Dutch-Finnish scientific and industrial consortium is supplying the Ozone Monitoring Instrument (OMI) for Earth Observing System-Aura (EOS-Aura). EOS-Aura is the next NASA mission to study the Earth's atmosphere extensively, and successor to the highly successful UARS (Upper Atmospheric Research Satellite) mission. The 'Science Requirements Document for OMI-EOS' presents an overview of the Aura and OMI mission objectives. It describes how OMI fits into the Aura mission and it reviews the synergy with the other instruments onboard Aura to fulfill the mission. This evolves in the Scientific Requirements for OMI (Chapter 3), stating which trace gases have to be measured with what necessary accuracy, in order for OMI to meet Aura's objectives. The most important data product of OMI, the ozone vertical column, densities shall have a better accuracy and an improved global coverage than the predecessor instruments TOMS (Total Ozone Monitoring Spectrometer) and GOME (Global Ozone Monitoring Experiment), which is a.o. achieved by a better signal to noise ratio, improved calibration and a wide field-of-view. Moreover, in order to meet its role on Aura, OMI shall measure trace gases, such as NO₂, OClO, BrO, HCHO and SO₂, aerosols, cloud top height and cloud coverage. Improved accuracy, better coverage, and finer ground grid than has been done in the past are goals for OMI. After the scientific requirements are defined, three sets of subordinate requirements are derived. These are: the algorithm requirements, i.e. what do the algorithms need in order to meet the scientific requirements; the instrument and calibration requirements, i.e. what has to be measured and how accurately in order to provide the quality of data necessary for deriving the data products; and the validation requirements, i.e. a strategy of how the OMI program will assure that its data products are valid in the atmosphere, at least to the required accuracy.

Author

Atmospheric Composition; Trace Elements; Ozone; Earth Observing System (EOS); Atmospheric Sounding; Optical Measuring Instruments; Radiation Measuring Instruments

20010082932 NASA Ames Research Center, Moffett Field, CA USA

Regenerable Air Purification System for Gas-Phase Contaminant Control

Constantinescu, Ileana C., Orbital Sciences Corp., USA; Qi, Nan, Vanderbilt Univ., USA; LeVan, M. Douglas, Vanderbilt Univ., USA; Finn, Cory K., NASA Ames Research Center, USA; Finn, John E., NASA Ames Research Center, USA; [2000]; 1p; In English; 4th International Conference on Life Support and Biosphere Science, 6-9 Aug. 2000, Baltimore, MD, USA
Contract(s)/Grant(s): RTOP 131-20-10; No Copyright; Avail: Issuing Activity; Abstract Only

A regenerable air purification system (RAPS) that uses water vapor to displace adsorbed contaminants from an adsorbent column into a closed oxidation loop is under development through cooperative R&D between Vanderbilt University and NASA Ames Research Center. A unit based on this design can be used for removing trace gas-phase contaminants from spacecraft cabin air or from polluted process streams including incinerator exhaust. Recent work has focused on fabrication and operation of a RAPS breadboard at NASA Ames, and on measurement of adsorption isotherm data for several important organic compounds at Vanderbilt. These activities support the use and validation of RAPS modeling software also under development at Vanderbilt, which will in turn be used to construct a prototype system later in the project.

Author

Air Purification; Contaminants; Vapor Phases; Water Vapor

20010082943 NASA Ames Research Center, Moffett Field, CA USA

Quantifying Denitrification and Its Effect on Ozone Recovery

Tabazadeh, A., NASA Ames Research Center, USA; Santee, M. L., Jet Propulsion Lab., California Inst. of Tech., USA; Danilin, M. Y., Atmospheric and Environmental Research, Inc., USA; Pumphrey, H. C., Edinburgh Univ., UK; Newman, P. A., NASA Goddard Space Flight Center, USA; Hamill, P. J., San Jose State Univ., USA; Mergenthaler, J. L., Lockheed Martin Corp., USA; [2000]; 1p; In English; 2000 AGU Spring Meeting, 2000, Unknown; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Upper Atmosphere Research Satellite observations indicate that extensive denitrification, without significant dehydration, currently occurs only in the Antarctic during mid to late June. The fact that denitrification occurs in a relatively warm month in the Antarctic raises concern about the likelihood of its occurrence, and associated effects on ozone recovery, in a future colder and possibly more humid Arctic lower stratosphere. Polar stratospheric cloud lifetimes required for Arctic denitrification to occur in the future are presented and contrasted against the current Antarctic cloud lifetimes. Model calculations show widespread severe denitrification could enhance future Arctic ozone loss by up to 30%.

Author

Denitrogenation; Ozone; Stratosphere; Antarctic Regions; Clouds (Meteorology)

46 GEOPHYSICS

Includes earth structure and dynamics, aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For related information see 47 Meteorology and Climatology; and 93 Space Radiation.

20010078919 NASA Goddard Space Flight Center, Greenbelt, MD USA

Characterization of Dust Properties at the Source Region During ACE-Asia

Tsay, Si-Chee, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; 3rd International Workshop on Aerosol-Cloud-Radiation Interaction, 22-27 Jul. 2001, Chongqing City, China; No Copyright; Avail: Issuing Activity; Abstract Only

ACE (Aerosol Characterization Experiment)-Asia is designed to study the compelling variability in spatial and temporal scale of both pollution-derived and naturally-occurring aerosols, which often exist in high concentrations over eastern Asia and along the rim of the western Pacific. The phase-I of ACE-Asia was conducted from March-May 2001 in the vicinity of the Gobi desert, east coast of China, Yellow Sea, Korea, and Japan, along the pathway of Kosa (severe events that blanket East Asia with yellow desert dust, peaked in the Spring season). Asian dust typically originates in desert areas far from polluted urban regions. During transport, dust layers can interact with anthropogenic sulfate and soot aerosols from heavily polluted urban areas. Added to the complex effects of clouds and natural marine aerosols, dust particles reaching the marine environment can have drastically different properties than those from the source. Thus, understanding the unique temporal and spatial variations of Asian dust is of special importance in regional-to-global climate issues such as radiative forcing, the hydrological cycle, and primary biological productivity in the mid-Pacific Ocean. During ACE-Asia we have measured continuously aerosol optical/radiative properties, column precipitable water amount, and surface reflectivity over homogeneous areas from surface. The inclusion of flux measurements permits the determination of dust aerosol radiative flux in addition to measurements of loading and optical thickness. At the time of the Terra/MODIS overpass, these ground-based observations can provide valuable data to compare with MODIS retrievals over land. Preliminary results will be presented and discussed their implications in regional climatic effects.

Author

Characterization; Marine Environments; Asia; Dust; Optical Properties

20010079652 NASA Goddard Space Flight Center, Greenbelt, MD USA

Modeling Wave Driven Non-linear Flow Oscillations: The Terrestrial QBO and a Solar Analog

Mayr, Hans G., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; CEDAR Prize Lecture, 17-22 Jun. 2001, Boulder, CO, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Quasi Biennial Oscillation (QBO) of the zonal circulation observed in the terrestrial atmosphere at low latitudes is driven by wave mean flow interaction as was demonstrated first by Lindzen and Holton (1968), shown in a laboratory experiment by Plumb and McEwan (1978), and modeled by others (e.g., Plumb, Dunkerton). Although influenced by the seasonal cycle of solar forcing, the QBO, in principle, represents a nonlinear flow oscillation that can be maintained by a steady source of upward propagating waves. The wave driven non-linearity is of third or odd order in the flow velocity, which regenerates the fundamental harmonic itself to keep the oscillation going - the fluid dynamical analog of the displacement mechanism in the mechanical clock. Applying Hines' Doppler Spread Parameterization (DSP) for gravity waves (GW), we discuss with a global-scale spectral model numerical experiments that elucidate some properties of the QBO and its possible effects on the climatology of the atmosphere. Depending on the period of the QBO, wave filtering can cause interaction with the seasonal variations to produce pronounced oscillations with beat periods around 10 years. Since the seasonal cycle and its variability influence the period of the QBO, it may also be a potent conduit of solar activity variations to lower altitudes. Analogous to the terrestrial QBO, we propose that a flow oscillation may account for the 22-year periodicity of the solar magnetic cycle, potentially answering Dicke (1978) who asked, "Is there a chronometer hidden deep inside the Sun?" The oscillation would occur below the convection region, where gravity waves can propagate. Employing a simplified, analytic model, Hines' DSP is applied to estimate the flow oscillation. Depending on the adopted horizontal wavelengths of GW's, wave amplitudes less than 10 m/s can be made to produce oscillating zonal flows of about 20 m/s that should be large enough to generate a significant oscillation in the magnetic field. For the large length scales of the Sun, the flow cycle period tends to be very long. The period, however, can be made to be 22 years, provided the buoyancy frequency (stability) is sufficiently small, thus placing the proposed flow near the base of the convection zone where a dynamo is now believed to operate.

Author

Gravity Waves; Mathematical Models; Quasi-Biennial Oscillation; Climatology; Nonlinearity; Solar Activity

20010082037 G and A Technical Software, Inc., Newport News, VA USA

HALOE Algorithm Improvements for Upper Tropospheric Soundings *Monthly Report, 1-31 Oct. 2000*

Thompson, Robert E., G and A Technical Software, Inc., USA; Nov. 03, 2000; 4p; In English

Contract(s)/Grant(s): NAS5-98076

Report No.(s): GATS-110300; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This report details the ongoing efforts by GATS, Inc., in conjunction with Hampton University and University of Wyoming, in NASA's Mission to Planet Earth UARS Science Investigator Program entitled "HALOE Algorithm Improvements for Upper Tropospheric Sounding." The goal of this effort is to develop and implement major inversion and processing improvements that will extend HALOE measurements further into the troposphere. In particular, O₃, H₂O, and CH₄ retrievals may be extended into the middle troposphere, and NO, HCl and possibly HF into the upper troposphere. Key areas of research being carried out to accomplish this include: pointing/tracking analysis; cloud identification and modeling; simultaneous multichannel retrieval capability; forward model improvements; high vertical-resolution gas filter channel retrievals; a refined temperature retrieval; robust error analyses; long-term trend reliability studies; and data validation. The current (first year) effort concentrates on the pointer/tracker correction algorithms, cloud filtering and validation, and multichannel retrieval development. However, these areas are all highly coupled, so progress in one area benefits from and sometimes depends on work in others.

Author

Halogen Occultation Experiment; Algorithms; Troposphere; Sounding

20010082527 Naval Observatory, Time Service Div., Washington, DC USA

Progress in Carrier Phase Time Transfer

Ray, Jim; Arias, Felicitas; Petit, Gerard; Springer, Tim; Schildknecht, Thomas; GPS Solutions; May 14, 2001; Volume 4, No. 4, pp. 47-54; In English

Report No.(s): AD-A390474; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The progress of the joint Pilot Project for time transfer, formed by the International GPS Service (IGS) and the Bureau International des Poids et Mesures (BIPM), was recently reviewed. Three notable milestones were set. 1) The IGS will implement, at least in a test mode, an internally realized time scale based on an integration of combined frequency standards within the IGS network. This will eventually become the reference time scale for all IGS clock products (instead of the current GPS broadcast time). 2) A new procedure for combined receiver and satellite clock products will be implemented officially in November 2000. Receiver clocks are an entirely new product of the IGS. 3) The BIPM will coordinate an effort to calibrate all Ashtech Z12-T (and possibly other) receivers suitable for time transfer applications, either differentially or absolutely. Progress reports will be presented publicly in the spring 2001.

DTIC

Global Positioning System; Time; Timing Devices

20010082795 University Navstar Consortium, Boulder, CO USA

Solid Earth and Natural Hazards (SENH) Research and Applications Program and Internation *Final Report, 1 Jul. 1999 - 31 May 2000*

[2001]; 3p; In English; Diskette: 1 3.5-inch DSHD diskette

Contract(s)/Grant(s): NAG5-8627

Report No.(s): NONP-NASA-DK-2001127592; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This is a final report for grant NAG5-8627 entitled 'Joint UNAVCO and JPL proposal to NASA for support of the Solid Earth and Natural Hazards Research and Applications Program and Internation'. This report consists of the following sections: (1) new installations (with site visits); (2) upgrades (with site visits); (3) upcoming upgrades (with site visits); and (4) data management and archive efforts during the performance period.

Derived from text

Data Management; Upgrading

20010082961 NASA Ames Research Center, Moffett Field, CA USA

Occurrence of Ice Supersaturations, Ice Clouds, and Ternary Aerosols in the Arctic Lowermost Stratosphere

Jensen, Eric, NASA Ames Research Center, USA; Selkirk, Henry, NASA Ames Research Center, USA; Pfister, Leonhard, NASA Ames Research Center, USA; Sachee, Glen, NASA Ames Research Center, USA; Podolske, James, NASA Ames Research Center, USA; Anderson, Bruce, NASA Ames Research Center, USA; [2000]; 1p; In English; SOLVE/Theseo Science Team Meeting, 25-29 Jun. 2000, Palermo, Italy; No Copyright; Avail: Issuing Activity; Abstract Only

Relative humidity, aerosol concentration, and ice crystals all have important impacts on chemistry and radiative transfer in the lowermost stratosphere. In this study, we have combined SOLVE measurements with meteorological analyses to investigate the statistics of humidity, aerosols, and clouds in the arctic lower stratosphere. First, we will present a statistical analysis of relative humidity with respect to ice in the lowermost stratosphere, used on the DC-8 in situ measurements. We will show examples of ice supersaturation well within the stratosphere. Generally, these cases were associated with extremely low temperatures near the tropopause. Next, we will discuss the climatological occurrence frequency of tropopause temperatures low enough for ice saturation even with typically low stratospheric water vapor mixing ratios. Really, we will examine case studies of ice clouds observed in the lowermost stratosphere during SOLVE. We will discuss the possible origin of these clouds (i.e., precipitation from higher type II PSCs, injection of tropospheric air into the lower stratosphere, etc.).

Author

Aerosols; Arctic Regions; Climatology; Ice Clouds; Stratosphere; Supersaturation

47

METEOROLOGY AND CLIMATOLOGY

Includes weather observation forecasting and modification

20010078921 NASA Goddard Space Flight Center, Greenbelt, MD USA

A TRMM-Calibrated Infrared Rainfall Algorithm Applied Over Brazil

Negri, Andrew J., NASA Goddard Space Flight Center, USA; Xu, L., Arizona Univ., USA; Adler, R. F., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

A satellite infrared (IR) technique for estimating rainfall over northern South America is presented. The objectives are to examine the diurnal variability of rainfall and to investigate the relative contributions from the convective and stratiform components. In this study, we apply the Convective-Stratiform Technique (CST) of Adler and Negri (1988). The parameters of the original technique were re-calibrated using coincident rainfall estimates (Olson et W., 2000) derived from the Tropical Rain Measuring Mission (TRMM) Microwave Imager (TMI) and GOES IR (11 micrometer) observations. Local circulations were found to play a major role in modulating the rainfall and its diurnal cycle. These included land/sea circulations (notably along the northeast Brazilian coast and in the Gulf of Panama), mountain/valley circulations (along the Andes Mountains), and circulations associated with the presence of rivers. This last category was examined in detail along the Amazon R. east of Manaus. There we found an early morning rainfall maximum along the river (5 LT at 58W, 3 LT at 56W). Rainfall avoids the river in the afternoon (12 LT and later), notably at 56 W. The width of the river seems to be generating a land/river circulation which enhances early morning rainfall but inhibits afternoon rainfall. Results are compared to ground-based radar data collected during the Large-Scale Biosphere-Atmosphere (LBA) experiment in southwest Brazil, to monthly raingages in northeastern Brazil, and to data from the TRMM Precipitation Radar.

Author

Algorithms; Brazil; Trmm Satellite; Infrared Radiation; Rain

20010078961 Colorado State Univ., Dept. of Atmospheric Science, Fort Collins, CO USA

Interactions of the Cloudy Arctic Boundary Layer with Variable Surface Conditions and Large-Scale Circulations *Final Report, 1 May 1998 - 30 Apr. 2001*

Randell, David A., Colorado State Univ., USA; [2001]; 16p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAG1-2081; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Our project included a variety of activities, ranging from model development to data manipulation and even participation in the SHEBA and FIRE field experiments. The following sections outline the work accomplished under these tasks. A collection of reprints is attached to this report.

Author

Arctic Regions; Boundary Layers; Clouds (Meteorology); Atmospheric Circulation; Mathematical Models; Wind (Meteorology)

20010079653 NASA Goddard Space Flight Center, Greenbelt, MD USA

Horizontal Wind Measurements using the HARLIE Holographic Lidar

Wilkerson, Thomas, Utah State Univ., USA; Andrus, Ionio, Utah State Univ., USA; Sanders, Jason, Utah State Univ., USA; Schwemmer, Geary, NASA Goddard Space Flight Center, USA; Miller, David, NASA Goddard Space Flight Center, USA; Guerra, David, Saint Anselm Coll., USA; [2001]; 1p; In English; 46th Annual SPIE Meeting, 29 Jul. - 3 Aug. 2001, San Diego,

CA, USA; Sponsored by International Society for Optical Engineering, USA; No Copyright; Avail: Issuing Activity; Abstract Only

We report the results of three campaigns in which the horizontal wind vector at cloud altitudes was measured using the holographic, conical-scan lidar HARLIE in its nadir-viewing mode. Measurements were made during the HOLO-1 and -2 tests in Utah and New Hampshire in March and June 1999, respectively, and at the DoE-ARM site in Oklahoma in September/October 2000. A novel algorithm facilitates the wind vector analysis of the HARLIE data. Observed wind velocity and direction were compared with radiosonde records and with other data obtained from video cloud imagery and independent lidar ranging. The results demonstrate good agreement between HARLIE data and the results of other methods. The conically scanning holographic lidar opens up new possibilities for obtaining the vertical profile of horizontal winds.

Author

Algorithms; Conical Scanning; Holography; Optical Radar; Wind Velocity Measurement

20010079988 NASA Goddard Space Flight Center, Greenbelt, MD USA

Responses of Precipitation and Hydrologic Processes to Tropical SST

Sui, C.-H., NASA Goddard Space Flight Center, USA; Lau, K.-M., NASA Goddard Space Flight Center, USA; Li, X., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; 7th International Conference on Precipitation, 30 Jun. - 3 Jul. 2001, Rockport, ME, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The goal of the research is to identify the mechanisms in the response of tropical precipitation and atmospheric hydrologic cycle to sea surface temperature (SST) variability at seasonal-to-interannual time scales, and to utilize the knowledge for better understanding of climate feedback processes relevant to global change. As a first step to achieve the goal, we characterize the inter-relationship among convective/stratiform rain, ice/water clouds water vapor, and SST using TRMM satellite data and a cloud-resolving model. We examined the daily hydrologic variables [column water vapor (PW), cloud liquid water (CW), rainfall rates (RR)] as a function of SST using high-resolution data (0.25 x 0.25, daily) derived from TRMM satellite measurements. Comparing the winter of 97/98 (El Nino condition) against the winter of 99/00 (La Nina condition), area-mean values of all four hydrologic variables in cloudy areas within the tropical Pacific are higher in the El Nino winter than in the La Nina winter. This is consistent with previous observational analyses and SST warming experiments (idealized or ENSO-like) that showed the interaction between hydrologic cyclic and radiation at the seasonal to interannual time scales leads to intensified tropical circulation and hydrologic cycle. However, there is evidence that the enhanced hydrologic cycle over the warm pool is accompanied by an expansion of radiatively -driven subsidence in response to a stronger SST gradient between warm pool and surrounding cold pool. The expanding subsidence effectively reduces cloud amounts over the warm pool. Our analysis of daily variability further indicates a more vigorous water cycle characterized by higher PW, CW, and RR in response to overall warming. This is expected from the Clausius Clapeyron relation as a thermodynamic response to warming. However cloudy areas decrease in response to overall warming. This may be due to factors that are fundamentally different. One possibility is that in a warmer climate, there may be alteration in the microphysical processes in clouds, e.g., increased coalescence of cloud size droplets and increased entrainment of dry air from above due to the invigorated convective motions in response to overall warming. As a result, cloud amounts are less. Another interpretation is that, in colder air masses, more ice particles will be produced and, because of their lower densities, are less likely to precipitate, hence the higher cloud amount. This suggests that, when averaged over a sufficiently large area covering both the rising and sinking branches of the tropical circulation, there maybe an increase in the precipitation efficiency in stratiform clouds, in conjunction with increased subsidence in an enhanced water cycle. This is supported by the residence time at different rainrates.

Author

Hydrology; Sea Surface Temperature; Tropical Regions; Precipitation (Meteorology); Clouds (Meteorology); Winter

20010079990 Research Development Corp. of Japan, Kawasaki, Japan

Several Findings in Observed Data and Field Observation

Kurauchi, Takashi, Research Development Corp. of Japan, Japan; Nakane, Kazurou, National Research Inst. for Earth Science and Disaster Prevention, Japan; Maitreeyuenyong, Visal, Royal Irrigation Dept., Thailand; Hydrological Processes in Tropical Regions; 1996, pp. 17-21; In English; Copyright Waived; Avail: CASI; A01, Hardcopy; A01, Microfiche

In 'Hydrological Processes in Tropical Regions' a joint research project between NRCT and NIED, field observation started mainly in February 1996 in the Khwae Noi River Basin. or a part of the Nan River Basin. Findings in observed data in February 1996 include: (a) There can be seen different type of rainfall, namely spotty shower and light continuous widespread rain. As the former one, rain on February 18 or 19 tends to be intense and short with gap in time and space. The rain on February 20, being lighter, longer and wider-ranged, seems to be more influenced by N-E or winter monsoon, by which air temperature dropped remarkably. (b) N-E monsoon was strong in period of February 9-10 and 19-23. (c) Strong wind was observed at Station D, which

is located in a flood plain of a basin (Nakhon Thai), where N-E monsoon is clearly recorded. However, some other stations like B and C did not illustrated clear figures. (d) As a matter of course, at Station E, or Rice Research Center test paddy field, relative humidity of lower sensor was high. (e) The observed data at NIED, Japan, suggests that a cold wave reached there on February 20-21. There may be certain relation between Thai and Japanese data. Findings in field observation include: (a) It is desirable to protect observation system from serious lightning damage as much as possible, even though sometimes inevitable; and (b) Countermeasures should be considered against problems caused by small lives. such as ants, birds, rats, etc..

Author

Tropical Regions; Hydrology; River Basins; Meteorology; Japan; Meteorological Parameters

20010080472 Colorado State Univ., Dept. of Atmospheric Sciences, Fort Collins, CO USA

Representation of Clear and Cloudy Boundary Layers in Climate Models, Chapter 14

Randall, D. A., Colorado State Univ., USA; Shao, Q., Arizona Univ., USA; Branson, M., Colorado State Univ., USA; [1997]; 20p; In English

Contract(s)/Grant(s): NAS1-19951; DE-FG03-94ER-61929; NAG1-1701; NSF ATM-94-19715; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The atmospheric general circulation models which are being used as components of climate models rely on their boundary layer parameterizations to produce realistic simulations of the surface turbulent fluxes of sensible heat, moisture, and momentum: of the boundary-layer depth over which these fluxes converge: of boundary layer cloudiness: and of the interactions of the boundary layer with the deep convective clouds that grow upwards from it. Two current atmospheric general circulation models are used as examples to show how these requirements are being addressed: these are version 3 of the Community Climate Model, which has been developed at the U.S. National Center for Atmospheric Research, and the Colorado State University atmospheric general circulation model. The formulations and results of both models are discussed. Finally, areas for future research are suggested.

Author

Atmospheric General Circulation Models; Boundary Layers; Climate Models; Convection; Turbulence

20010080478 NASA Ames Research Center, Moffett Field, CA USA

How do Polar Stratospheric Clouds Form?

Drdla, Katja, NASA Ames Research Center, USA; Gandrud, Bruce, NASA Ames Research Center, USA; Baumgardner, Darrel, NASA Ames Research Center, USA; Herman, Robert, NASA Ames Research Center, USA; [2000]; 1p; In English

Contract(s)/Grant(s): NASA Order H-7057; No Copyright; Avail: Issuing Activity; Abstract Only

SOLVE measurements have been compared with results from a microphysical model to understand the composition and formation of the polar stratospheric clouds (PSCs) observed during SOLVE. Evidence that the majority of the particles remain liquid throughout the winter will be presented. However, a small fraction of the particles do freeze, and the presence of these frozen particles can not be explained by current theories, in which the only freezing mechanism is homogeneous freezing to ice below the ice frost point. Alternative formation mechanisms, in particular homogeneous freezing above the ice frost point and heterogeneous freezing, have been explored using the microphysical model. Both nitric acid trihydrate (NAT) and nitric acid dihydrate (NAD) have been considered as possible compositions for the solid-phase nitric acid aerosols. Comparisons between the model results and the SOLVE measurements will be used to constrain the possible formation mechanisms. Other effects of these frozen particles will also be discussed, in particular denitrification.

Author

Clouds (Meteorology); Stratosphere

20010081059 Colorado State Univ., Dept. of Atmospheric Sciences, Fort Collins, CO USA

Toward a Unified Parameterization of the Boundary Layer and Moist Convection, Part 2, Lateral Mass Exchanges and Subplume-Scale Fluxes

Lappan, Cara-Lyn, Colorado State Univ., USA; Randall, David A., Colorado State Univ., USA; Journal of the Atmospheric Sciences; Aug. 01, 2001, pp. 2037-2051; In English

Contract(s)/Grant(s): JPL-960700; NAG1-1701; NSF OPP-95-04246; Copyright; Avail: Issuing Activity

The dissipation parameterizations developed for higher-order closure are used to parameterize lateral entrainment and detrainment in a mass-flux model. In addition, a subplume-scale turbulence scheme is included to represent fluxes not captured

in the conventional mass-flux framework. These new parameterizations are tested by simulating trade wind cumulus from the Barbados Oceanographic and Meteorological Experiment (BOMEX).

Author

Boundary Layers; Moisture; Convection; Parameterization; Turbulence

20010081944 Colorado State Univ., Fort Collins, CO USA

Toward a Unified Parameterization of the Boundary Layer and Moist Convection, Part 1, A New Type of Mass-Flux Model

Lappen, Cara-Lyn, Colorado State Univ., USA; Randall, David A., Colorado State Univ., USA; Journal of the Atmospheric Sciences; Aug. 01, 2001; Volume 58, No. 15, pp. 2021-2036; In English

Contract(s)/Grant(s): JPL-960700; NAG1-1701; NSF OPP-95-04246; Copyright; Avail: Issuing Activity

Higher-order closure (HOC) models have been proposed for parameterization of the turbulent planetary boundary layer (PBL). HOC models must include closures for higher-order moments (e.g., fourth moments in third-order closure models), for pressure terms, and for dissipation terms. Mass-flux closure (MFC) models have been proposed for parameterization of cumulus convection and, more recently, the convective PBL. MFC models include closures for lateral mass exchanges and for pressure terms (which are usually ignored). The authors developed a new kind of model that combines HOC and MFC, which they hope will be useful for the parameterization of both the PBL and cumulus convection, in a unified framework. Such a model is particularly well suited to regimes in which the PBL turbulence and the cumulus convection are not well separated, for example, the broken stratocumulus and shallow cumulus regimes. The model makes use of an assumed joint probability distribution for the variables of interest, and the equations typically used in HOC models can be derived by integrating over the distribution. Accordingly, the model is called Assumed-Distribution Higher-Order Closure (ADHOC). The prognostic variables of ADHOC are the mean state, the second and third moments of the vertical velocity, and the vertical fluxes of other quantities of interest. All of the parameters of the distribution can be determined from the predicted moments, thereafter the joint distribution is effectively known, and so any and all moments can be constructed as needed. In this way, the usual closure problem of "higher moments" is avoided. The pressure-term parameterizations previously developed for HOC models are used to predict the convective fluxes and the moments of the vertical velocity. In companion papers, parameterizations of lateral mass exchanges and subplume-scale fluxes are presented, and then ADHOC is applied to several observationally based tropical, subtropical, and dry convective boundary layers.

Author

Parameterization; Convection; Turbulent Boundary Layer; Mathematical Models; Clouds (Meteorology)

20010081950 NASA Ames Research Center, Moffett Field, CA USA

AWE: Aviation Weather Data Visualization

Spirkovska, Lilly, NASA Ames Research Center, USA; Lodha, Suresh K., California Univ., USA; [2000]; 6p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The two official sources for aviation weather reports both require the pilot to mentally visualize the provided information. In contrast, our system, Aviation Weather Environment (AWE) presents aviation specific weather available to pilots in an easy to visualize form. We start with a computer-generated textual briefing for a specific area. We map this briefing onto a grid specific to the pilot's route that includes only information relevant to his flight route that includes only information relevant to his flight as defined by route, altitude, true airspeed, and proposed departure time. by modifying various parameters, the pilot can use AWE as a planning tool as well as a weather briefing tool.

Author

Scientific Visualization; Weather; Meteorological Parameters

20010082519 Colorado State Univ., Dept. of Atmospheric Science, Fort Collins, CO USA

New Approaches to Parameterizing Convection

Randall, David A., Colorado State Univ., USA; Lappen, Cara-Lyn, Colorado State Univ., USA; [1999]; 10p; In English

Contract(s)/Grant(s): JPL-960700; NAG1-1701; NSF ATM-91-21629; NSF OPP-95-04246; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Many general circulation models (GCMs) currently use separate schemes for planetary boundary layer (PBL) processes, shallow and deep cumulus (Cu) convection, and stratiform clouds. The conventional distinctions among these processes are somewhat arbitrary. For example, in the stratocumulus-to-cumulus transition region, stratocumulus clouds break up into a combination of shallow cumulus and broken stratocumulus. Shallow cumulus clouds may be considered to reside completely within the PBL, or they may be regarded as starting in the PBL but terminating above it. Deeper cumulus clouds often originate within the PBL with also can originate aloft. to the extent that our models separately parameterize physical processes which

interact strongly on small space and time scales, the currently fashionable practice of modularization may be doing more harm than good.

Author

Atmospheric General Circulation Models; Cumulus Clouds; Planetary Boundary Layer; Stratocumulus Clouds

20010082948 NASA Ames Research Center, Moffett Field, CA USA

Simulations of the Vertical Redistribution of HNO₃ by NAT or NAD PSCs: The Sensitivity to the Number of Cloud Particles Formed and the Cloud Lifetime

Jensen, Eric J., NASA Ames Research Center, USA; Tabazadeh, Azadeh, NASA Ames Research Center, USA; Drdla, Katja, NASA Ames Research Center, USA; Toon, Owen B., Colorado Univ., USA; [2000]; 1p; In English; 2000 AGU Spring Meeting, 2000, Unknown; Sponsored by American Geophysical Union, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Recent satellite and in situ measurements have indicated that limited denitrification can occur in the Arctic stratosphere. In situ measurements from the SOLVE campaign indicate polar stratospheric clouds (PSCs) composed of small numbers (about $3 \times 10^{-4} \text{ cm}^{-3}$) of 10-20 micron particles (probably NAT or NAD). These observations raise the issue of whether low number density NAT PSCs can substantially denitrify the air with reasonable cloud lifetimes. In this study, we use a one dimensional cloud model to investigate the vertical redistribution of HNO₃ by NAT/NAD PSCs. The cloud formation is driven by a temperature oscillation which drops the temperature below the NAT/NAD formation threshold (about 195 K) for a few days. We assume that a small fraction of the available aerosols act as NAT nuclei when the saturation ratio of HNO₃ over NAT(NAD) exceeds 10(1.5). The result is a cloud between about 16 and 20 km in the model, with NAT/NAD particle effective radii as large as about 10 microns (in agreement with the SOLVE data). We find that for typical cloud lifetimes of 2-3 days or less, the net depletion of HNO₃ is no more than 1-2 ppbv, regardless of the NAT or NAD particle number density. Repeated passes of the air column through the cold pool build up the denitrification to 3-4 ppbv, and the cloud altitude steadily decreases due to the downward transport of nitric acid. Increasing the cloud lifetime results in considerably more effective denitrification, even with very low cloud particle number densities. As expected, the degree of denitrification by NAT clouds is much larger than that by NAD Clouds. Significant denitrification by NAD Clouds is only possible if the cloud lifetime is several days or more. The clouds also cause a local maximum HNO₃ mixing ratio at cloud base where the cloud particles sublimate.

Author

Clouds (Meteorology); Nitric Acid; Stratosphere; Aerosols; Sensitivity; Computerized Simulation

20010082950 NASA Goddard Space Flight Center, Greenbelt, MD USA

Status of and Outlook for Largescale Modeling of Atmosphere-Ice-Ocean Interactions in the Arctic

Randall, David, Colorado State Univ., USA; Curry, Judith, Colorado Univ., USA; Battisti, David, Washington Univ., USA; Flato, Gregory, Canadian Centre for Climate Modeling and Analysis, Canada; Grumbine, Robert, National Centers for Environmental Prediction, USA; Hakkinen, Sirpa, NASA Goddard Space Flight Center, USA; Martinson, Doug, Lamont-Doherty Geological Observatory, USA; Preller, Ruth, Naval Research Lab., USA; Walsh, John, Illinois Univ., USA; Weatherly, John, National Center for Atmospheric Research, USA; Bulletin of the American Meteorological Society; February 1998; ISSN 0003-0007; Volume 79, No. 2, pp. 197-219; In English; Copyright; Avail: Issuing Activity

Arctic air masses have direct impacts on the weather and climatic extremes of midlatitude areas such as central North America. Arctic physical processes pose special and very important problems for global atmospheric models used for climate simulation and numerical weather prediction. At present, the observational database is inadequate to support research aimed at overcoming these problems. Three interdependent Arctic field programs now being planned will help to remedy this situation: SHEBA, which will operate an ice camp in the Arctic for a year-, ARM, which will supply instruments for use at the SHEBA ice camp and which will also conduct longer-term measurements near Barrow, Alaska; and FIRE, which will conduct one or more aircraft campaigns, in conjunction with remote-sensing investigations focused on the SHEBA ice camp. This paper provides an introductory overview of the physics of the Arctic from the perspective of large-scale modelers, outlines some of the modeling problems that arise in attempting to simulate these processes, and explains how the data to be provided by the three field programs can be used to test and improve large-scale models.

Author

Air Sea Ice Interactions; Arctic Regions; Climatology; Numerical Weather Forecasting; Remote Sensing

20010082953 Colorado State Univ., Dept. of Atmospheric Sciences, Fort Collins, CO USA

Toward a Unified Parameterization of the Boundary Layer and Moist Convection, Part 3, Simulations of Clear and Cloudy Convection

Lappen, Cara-Lyn, Colorado State Univ., USA; Randall, David A., Colorado State Univ., USA; Journal of the Atmospheric

Sciences; [2001]; Volume 58, pp. 2052-2072; In English

Contract(s)/Grant(s): JPL-960700; NAG1-1701; NSF OPP-95-04246; Copyright; Avail: Issuing Activity

A model that employs a new form of mass-flux closure (described in Part I of this paper) is applied to a variety of clear and cloudy planetary boundary layers (PBLs) including dry convection from the Wangara Experiment, trade wind cumulus from the Barbados Oceanographic and Meteorological Experiment (BOMEX), and marine stratocumulus from the Atlantic Stratocumulus Experiment (ASTEX). For Wangara, the simulated variances and fluxes match that expected from similarity arguments, while the mean state is a little less mixed than the observations. In the BOMEX simulation, the shape and magnitude of the fluxes and the turbulence kinetic energy budget agree with LES results and observations. However, the liquid water mixing ratio is too large. This is attributed to an underprediction of the skewness. In agreement with observations from the ASTEX experiment, many of the model-simulated fields distinctly reflect a regime in transition between the trade wind cumulus and the classic stratocumulus-topped boundary layers. In general, the simulated entrainment rate tends to be a little underpredicted in regimes where there is little cloud-top radiative cooling (Wangara and BOMEX), while it is overpredicted in regimes where this process is more critical (e.g., ASTEX). Prior work suggests that this may be related to the manner in which the pressure terms are parameterized in the model. Overall, the model is able to capture some key physical features of these PBL regimes, and appears to have the potential to represent both cloud and boundary layer processes. Thus, this approach is a first step toward unifying these processes in large-scale models.

Author

Boundary Layers; Convection; Parameterization; Stratocumulus Clouds; Marine Meteorology; Cloud Cover

48

OCEANOGRAPHY

Includes the physical, chemical and biological aspects of oceans and seas; ocean dynamics, and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

20010079196 Environmental Protection Agency, Chesapeake Bay Program, Annapolis, MD USA

Environmental Outcome-Based Management: Using Environmental Goals and Measures in the Chesapeake Bay Program

Jun. 2001; 44p

Report No.(s): PB2001-107394; EPA/903/R-00/016; CBP/TRS-248/00; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Over the past decade, the U.S. Environmental Protection Agency (EPA) and its Chesapeake Bay Program partners have maintained a systematic approach for the use of this information to inform the public about the state of the Bay, to establish measurable restoration goals, and to inform many other program management decisions. EPA believes that much of the progress of this restoration program can be attributed to its partnership approach and the participants' willingness to set bold, long-term environmental goals and to use environmental and other outcome measures to set bold, long-term environmental goals and to use environmental and other outcome measures to monitor results and inform the public. Lessons learned from this program may be of particular interest to other natural resource agencies and to any governmental entity with interest in outcome-based management.

NTIS

Environment Protection; Earth Resources Program; Watersheds; Management Systems

51

LIFE SCIENCES (GENERAL)

Includes general research topics related to plant and animal biology (non-human); ecology; microbiology; and also the origin, development, structure, and maintenance, of animals and plants in space and related environmental conditions. For specific topics in life sciences see categories 52 through 55.

20010078925 Complete Conference Management, San Diego, CA USA

Eighth International Symposium on Blood Substitutes Final Report, 15 Sep. 2000 - 30 Apr. 2001

Winslow, Robert M.; Apr. 2001; 116p; In English, 9-11 Nov. 2000, San Diego, CA, USA; Sponsored by California Univ., USA
Contract(s)/Grant(s): DAMD17-00-1-0708

Report No.(s): AD-A390037; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Partial contents: blood substitutes: current status and new challenges, oxygen sensing and oxygen-dependent gene expression, the intrinsic stability of liganded hemoglobins is destabilized by chloride: role of site-specific intramolecular microdomains, administration of fluorocarbon emulsion reduces deoxyhemoglobin in liver and kidney of a sickle transgenic mouse model, site specific surface decoration of hemoglobin-a with polyethylene glycol: correlation between increased hydrodynamic volume and mass of peg conjugated, hyperoncotic, hyperosmotic and hyperosmotic/hyperoncotic hemoglobin solutions, complete circulatory restoration using hemospan in resuscitation of hemorrhagic shock in pigs, current perceived risks of transfusion in the uk and relevance to the future acceptance of blood substitutes, recent progress in the clinical development of oxygentim as an intravenous oxygen carrier for use in elective surgery, design of second generation recombinant hemoglobin: minimizing nitric oxide scavenging and vasoactivity while maintaining efficacy, hemoglobin-induced myocardial lesions, phase iii clinical trial of hemolinktm in conjunction with intraoperative autologous donation (lad) in cardiac surgical patients.

DTIC

Conferences; Clinical Medicine; Blood; Substitutes

20010082955 NASA Ames Research Center, Moffett Field, CA USA

Life Sciences Research in the Centrifuge Accommodation Module of the International Space Station

Dalton, Bonnie P., NASA Ames Research Center, USA; Plaut, Karen, NASA Ames Research Center, USA; Meeker, Gabrielle B., NASA Ames Research Center, USA; [2000]; 1p; In English; 30th International Conference on Environmental Systems, 10-13 Jul. 2000, Toulouse, France, France; Sponsored by Society of Automotive Engineers, Inc., USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Centrifuge Accommodation Module (CAM) will be the home of the fundamental biology research facilities on the International Space Station (ISS). These facilities are being built by the Biological Research Project (BRP), whose goal is to oversee development of a wide variety of habitats and host systems to support life sciences research on the ISS. The habitats and host systems are designed to provide life support for a variety of specimens including cells, bacteria, yeast, plants, fish, rodents, eggs (e.g., quail), and insects. Each habitat contains specimen chambers that allow for easy manipulation of specimens and alteration of sample numbers. All habitats are capable of sustaining life support for 90 days and have automated as well as full telepresence capabilities for sending habitat parameters data to investigator home site laboratories. The habitats provide all basic life support capabilities including temperature control, humidity monitoring and control, waste management, food, media and water delivery as well as adjustable lighting. All habitats will have either an internal centrifuge or are fitted to the 2.5-meter diameter centrifuge allowing for variable centrifugation up to 2 g. Specimen chambers are removable so that the specimens can be handled in the life sciences glovebox. Laboratory support equipment is provided for handling the specimens. This includes a compound and dissecting microscope with advanced video imaging, mass measuring devices, refrigerated centrifuge for processing biological samples, pH meter, fixation and complete cryogenic storage capabilities. The research capabilities provided by the fundamental biology facilities will allow for flexibility and efficiency for long term research on the International Space Station.

Author

Life Sciences; Research Facilities; International Space Station

52

AEROSPACE MEDICINE

Includes the biological and physiological effects of atmospheric and space flight (weightlessness, space radiation, acceleration, and altitude stress) on the human being; and the prevention of adverse effects on those environments. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science. For the effects of space on animals and plants see 51 Life Sciences.

20010081596 Institute of Space Medico-Engineering, Beijing, China

Space Medicine and Medical Engineering

Xu, Z.; Hangtian Yixue Yu Yixue Gongcheng; Jun. 2000; Volume 13, No. 3; 82p; In Mixed; Portions of this document are not fully legible

Report No.(s): PB2001-106247; Copyright; Avail: National Technical Information Service (NTIS)

Partial Contents: A Frequency Weighting Contour for Chinese Young Males; Numerical Study of Ventilation and Heat Transfer Performance in a Square Space; Protective Effects of Gangliosides on Cerebral Neuronal Damage of Rat during Acute Hypoxia; Effect of Combined Stress on Plasma CuZn-SOD and Erythrocyte Membrane T-AOC in Pilots; Detection of Microbes

Adherent to Particles in a Closed Environment; The Analysis and Improvement Consideration of the Current Human Experimental Models of Humoral Regulation in Microgravity.

NTIS

Aerospace Medicine; Frequencies; Contours; Heat Transfer; Ventilation; Neurophysiology; Combined Stress; Microorganisms

20010081748 Civil Aerospace Medical Inst., Oklahoma City, OK USA

Association of Postmortem Blood Hemoglobin A(sub 1c) Levels With Diabetic Conditions in Aviation Accident Pilot Fatalities Final Report

White, Vicky L., Civil Aerospace Medical Inst., USA; Chaturvedi, Arvind K., Civil Aerospace Medical Inst., USA; Canfield, Dennis V., Civil Aerospace Medical Inst., USA; Garber, Mitchell, National Transportation Safety Board, USA; July 2001; 8p; In English

Contract(s)/Grant(s): AM-B-00-TOX-202; AM-B-01-TOX-202

Report No.(s): DOT/FAA/AM-01/12; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Federal Aviation Administration's (FAA's) Office of Aerospace Medicine evaluates present and proposed medical certification standards for pilots. Under this responsibility, the FAA Civil Aerospace Medical Institute investigates the role of potential medical-or drug-related performance impairment in pilots. In previous research, abnormal glucose levels in vitreous humor (>125 mg/dL) and urine (>100 mg/dL) have been linked with diabetic conditions in pilots of fatal aviation accidents. Although these abnormal glucose levels identify pilots with elevated blood sugar at the time of death, they do not provide information on how well diabetes was controlled in these pilots. Since post-crash factors (trauma, stress, medical intervention) can dramatically affect blood glucose levels, a measure of long-term diabetic control was sought for postmortem specimens. Blood specimens from volunteers were collected and stored at room temperature for up to 52 days to mimic a postmortem condition. These specimens were analyzed for hemoglobin A(sub 1c), (HbA(sub 1c) at selected time intervals during the 52-day period. Postmortem blood specimens from 34 aviation accident pilot fatalities were also analyzed. Some of these pilots had a known history of diabetes. Results. HbA(sub 1c) values in blood from volunteers did not significantly change for up to 52 days. The HbA(sub 1c) concentration in postmortem blood samples from pilots ranged from 3.9-10.5%. Only one pilot with a HbA(sub 1c) over 6.0% did not have a history of diabetes reported to the FAA. Conclusions. HbA(sub 1c) is stable in whole blood stored at room temperature for 52 days and appears to be stable in postmortem blood stored up to 84 days. HbA(sub 1c) above 6.0% was found to be generally correlated with a known history of diabetes and with the abnormal vitreous humor and urine glucose levels established previously. Elevated postmortem HbA(sub 1c) levels may be useful in supporting determinations of medical impairment/incapacitation in transportation accidents.

Author

Hemoglobin; Blood; Aircraft Accidents; Physiological Effects; Metabolic Diseases

20010081931 Institute of Space Medico-Engineering, Beijing, China

Space Medicine and Medical Engineering

Liu, Y.; Hangtian Yixue Yu Yixue Gongcheng; Aug. 2000; Volume 13, No. 4; 60p; In Mixed; Portions of this document are not fully legible

Report No.(s): PB2001-106248; Copyright; Avail: National Technical Information Service (NTIS)

Partial Contents: Effects of Tail Suspension on Learning and Memory Function of Mice; A Simulated Study of Effects of Simulated Hypovolemia on Cardiovascular Response to Orthostatic Stress; Effects of CO₂ Concentration on Growth and Development of Lettuce in Controlled Environment; A Dual Channel Simultaneous Impedance Plethysmograph; Changes of Femur Minerals and Serum BGP in Handlimb Unloaded Rats during Convalescence; Change of Pulmonary Circulation in Microgravity and Simulated Microgravity.

NTIS

Aerospace Medicine; Physiological Responses; Hypovolemia; Femur; Minerals; Pulmonary Circulation; Suspensions

20010081932 Institute of Space Medico-Engineering, Beijing, China

Space Medicine and Medical Engineering

Hangtian Yixue Yu Yixue Gongcheng; Oct. 2000; Volume 13, No. 5; 88p; In Mixed; Portions of this document are not fully legible
Report No.(s): PB2001-106249; Copyright; Avail: National Technical Information Service (NTIS)

Partial Contents: Effects of Sound Preconditioning on Hearing Loss from Low or Middle-Frequency Noise Exposure; Human Physiological Regulation in the Closed Suit with no Ventilation; The Development of a Static Water/Gas Separator; Implementation of a Software for Acquiring and Analyzing Myoelectric Potential Signals in Ergonomical Research of Space

Manual System; Changes of Glucocorticoid Receptor in Cerebral and Hepatic Cytosol during Decompression Stress Injury in Rats; Call for Papers of the Fifth Man-Machine-Environment System Engineering Academic Meetings.

NTIS

Aerospace Medicine; Human Factors Engineering; Auditory Defects; Receptors (Physiology)

20010081933 Institute of Space Medico-Engineering, Beijing, China

Space Medicine and Medical Engineering

Xiao, Z. J.; Hangtian Yixue Yu Yixue Gongcheng; Dec. 2000; Volume 13, No. 6; 100p; In Mixed; Portions of this document are not fully legible

Report No.(s): PB2001-106250; Copyright; Avail: National Technical Information Service (NTIS)

Partial Contents: Stability of EEG Complexity Measure Related to Brain Function State; Effect of Acute Hypoxia on Plasma Lactic Acid and Lactic Dehydrogenase Content in Pilots; Mass Analysis of Condensation-free Walls in a Spacecraft; Analysis of a New Type Active Noise Cancellation Ear muffs; Disquisition of a new Quantitative Dilution Method for Bacterial Culture; Spaceflight Activities and the Analysis of Their Possible Mechanisms.

NTIS

Aerospace Medicine; Electroencephalography; Hypoxia; Stability

20010082525 NASA Ames Research Center, Moffett Field, CA USA

Development of NASA-DeBakey Ventricular Assist Device Using Numerical Aerospace Simulation Technology

Kwak, Dochan, NASA Ames Research Center, USA; [2000]; 12p; In English, 27 Jul. 2000, Seoul, Korea, Republic of; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Over three million Americans and 20 million people worldwide suffer from some form of heart failure. Mechanical heart assist devices are being used as a temporary support to sick ventricle and valves as a bridge-to-transplant or bridge-to-recovery. This viewgraph presentation gives an overview of the development of NASA-DeBakey Ventricular Assist Device (VAD) using numerical aerospace simulation technology.

Derived from text

Heart; Mechanical Devices; Computerized Simulation; Technology Utilization

20010082941 American Medical Informatics Association, Bethesda, MD USA

AMIA 2000 Annual Symposium. Abstract and Executive Summary of Conference

Overhage, J. M., American Medical Informatics Association, USA; 2001; 26p; In English

Report No.(s): PB2001-106535; AHRQ-2001-67; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

The American Medical Informatics Association's Annual Fall Symposium is the premier medical informatics meeting drawing nearly 2,000 attendees from every state, 36 countries and all of the major academic medical centers across the USA. The program, which included in-depth tutorials workshops, paper presentations, panel, theater style demonstrations and meet the expert sessions, awards, and keynote speaker combined to create a very diverse and satisfying experience for the attendees as judged by their evaluation of the program. In addition, we created a research agenda for medical informatics from the meeting by examining the submission content and opinions of the session chairs and attendees. We identified applied or operational research topics best explored by developmental support, demonstrations and evaluation as well as more theoretic or basic research areas that will require laboratory investigation and basic developmental work.

NTIS

Conferences; Medical Services; Research

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human factors engineering; bionics, man-machine, life support, space suits and protective clothing. For related information see also 16 Space Transportation and 52 Aerospace Medicine..

20010078922 Michigan Univ., Div. of Research Development and Administration, Ann Arbor, MI USA

Computational Modeling of Multimodal I/O in Simulated Cockpits Final Report, 1 Jun. 1996-30 Dec. 2000

Kieras, David E.; May 30, 2001; 11p; In English

Contract(s)/Grant(s): N000014-96-1-0467

Report No.(s): AD-A390675; TR-01/ONR-EPIC-15; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes the results of a project on modeling the effects of localized 3-D sound to facilitate performance in a complex cockpit-like dual task. This task that had been previously observed to produce a significant automation deficit effect: when one of the tasks has to be resumed at short notice, the human operator takes some time to "catch up" and reach the normal steady-state level of performance in the task, apparently because it takes visual search and inspection to identify the proper object on the display to process. Providing a localized sound cue to identify the proper object alleviates the automation deficit effect to some extent. Constructing computational cognitive models that include representation of the perceptual-motor systems underlying performance showed that the benefit appears to be due to low-level orienting reflex eye movements rather than high-level strategic use of the sound information.

DTIC

Mathematical Models; Cockpits; Input/Output Routines; Eye Movements

20010081946 NASA Ames Research Center, Moffett Field, CA USA

Matching Crew Diet and Crop Food Production in BIO-Plex

Jones, Harry, NASA Ames Research Center, USA; Kwauk, Xianmin, Sverdrup Technology, Inc., USA; [2000]; ISSN 0148-7191; 21p; In English; 30th International Conference on Environmental Systems, 10-13 Jul. 2000, Toulouse, France

Contract(s)/Grant(s): RTOP 131-20-10

Report No.(s): OOICES-434; Copyright; Avail: Issuing Activity

This paper matches the BIO-Plex crop food production to the crew diet requirements. The expected average calorie requirement for BIO-Plex is 2,975 Calories per crewmember per day, for a randomly selected crew with a typical level of physical activity. The range of 2,550 to 3,400 Calories will cover about two-thirds of all crews. The exact calorie requirement will depend on the gender composition, individual weights, exercise, and work effort of the selected crew. The expected average crewmember calorie requirement can be met by 430 grams of carbohydrate, 100 grams of fat, and 90 grams of protein per crewmember per day, for a total of 620 grams. Some fat can be replaced by carbohydrate. Each crewmember requires only 2 grams of vitamins and minerals per day. Only unusually restricted diets may lack essential nutrients. The Advanced Life Support (ALS) consensus is that BIO-Plex should grow wheat, potato, and soybean, and maybe sweet potato or peanut, and maybe lettuce and tomato. The BIO-Plex Biomass Production System food production and the external food supply must be matched to the crew diet requirement for calories and nutritional balance. The crop production and external supply specifications can each be varied as long as their sum matches the required diet specification. We have wide flexibility in choosing the crops and resupply. We can easily grow one-half the crew calories in one BIO-Plex Biomass Production Chamber (BPC) if we grow only the most productive crops (wheat, potato, and sweet potato) and if we achieve nominal crop productivity. If we assume higher productivity we can grow a wider variety of crops. If we grow one-half of the crew calories, externally supplied foods can easily provide the other half of the calories and balance the diet. We can not grow 95 percent of the crew calories in two BPCs at nominal productivity while growing a balanced diet. We produce maximum calories by growing wheat, potato, and peanut.

Author

Diets; Spacecrews; Metabolism; Physical Exercise

20010082933 NASA Ames Research Center, Moffett Field, CA USA

Power Management in Regenerative Life Support Systems

Crawford, Sekou, Orbital Sciences Corp., USA; Pawlowski, Christopher, Orbital Sciences Corp., USA; Finn, Cory, NASA Ames Research Center, USA; [1999]; 1p; In English; International Conference on Environmental Systems, 10-13 Jul. 2000, Toulouse, France

Contract(s)/Grant(s): RTOP 131-20-10; No Copyright; Avail: Issuing Activity; Abstract Only

Effective management of power can reduce the cost of launch and operation of regenerative life support systems. Variations in power may be quite severe and may manifest as surges or spikes. While the power plant may have some ability to deal with these variations, with batteries for example, over-capacity is expensive and does nothing to address the fundamental issue of excessive demand. Because the power unit must be sized to accommodate the largest demand, avoiding power spikes has the potential to reduce the required size of the power plant while at the same time increasing the dependability of the system. Scheduling of processors can help to reduce potential power spikes. However, not all power-consuming equipment is easily scheduled. Therefore, active power management is needed to further decrease the risk of surges or spikes. We investigate the use of a hierarchical scheme to actively manage power for a model of a regenerative life support system. Local level controllers individually determine subsystem power usage. A higher level controller monitors overall system power and detects surges or spikes. When a surge condition is detected, the higher level controller conducts an 'auction' and describes subsystem power usage to re-allocate power. The result is an overall reduction in total power during a power surge. The auction involves each subsystem making a 'bid' to buy or sell power based on local needs. However, this re-allocation cannot come at the expense of life support

function. to this end, participation in the auction is restricted to those processes meeting certain tolerance constraints. These tolerances represent acceptable limits within which system processes can be operated. We present a simulation model and discuss some of our results.

Author

Life Support Systems; Systems Management; Power

20010082954 NASA Ames Research Center, Moffett Field, CA USA

An Assessment of the Technical Readiness of the Vapor Phase Catalytic Ammonia Removal Process (VPCAR) Technology

Flynn, Michael, NASA Ames Research Center, USA; [2000]; 1p; In English; 4th International Conference on Life Support and Biosphere Science, 6-9 Aug. 2000, Baltimore, MD, USA

Contract(s)/Grant(s): RTOP 131-20-10; No Copyright; Avail: Issuing Activity; Abstract Only

This poster provides an assessment of the technical readiness of the Vapor Phase Catalytic Ammonia Removal Process (VPCAR). The VPCAR technology is a fully regenerative water recycling technology designed specifically for applications such as a near term Mars exploration mission. The VPCAR technology is a highly integrated distillation/catalytic oxidation based water processor. It is designed to accept a combined wastewater stream (urine, condensate, and hygiene) and produces potable water in a single process step which requires -no regularly scheduled re-supply or maintenance for a 3 year mission. The technology is designed to be modular and to fit into a volume comparable to a single International Space Station Rack (when sized for a crew of 6). This poster provides a description of the VPCAR technology and a summary of the current performance of the technology. Also provided are the results of two separate NASA sponsored system trade studies which investigated the potential payback of further development of the VPCAR technology.

Author

Ammonia; Vapor Phases; Technology Utilization; Catalytic Activity

55

EXO BIOLOGY

Includes astrobiology; planetary biology; and extraterrestrial life. For the biological effects of aerospace environments on humans see 52 Aerospace medicine; on animals and plants see 51 Life Sciences. For psychological and behavioral effects of aerospace environments see 53 Behavioral Science.

20010082947 NASA Ames Research Center, Moffett Field, CA USA

Where is Extraterrestrial Life Likely to be Found

McKay, Christopher P., NASA Ames Research Center, USA; [2000]; 1p; In English; American Society of Microbiology Meeting, 23-24 May 2000, Los Angeles, CA, USA; Sponsored by American Society of Microbiology, USA

Contract(s)/Grant(s): RTOP 344-38-82-04; No Copyright; Avail: Issuing Activity; Abstract Only

Mars appears to be cold dry and dead world. However there is good evidence that early in its history it had liquid water, more active volcanism, and a thicker atmosphere. Mars had this earthlike environment over three and a half billion years ago, during the same time that life appeared on Earth. The main question in the exploration of Mars then is the search for a independent origin of life on that planet. Ecosystems in cold, dry locations on Earth - such as the Antarctic - provide examples of how life on Mars might have survived and where to look for fossils. Although the Viking results may indicate that Mars has no life today, there is direct geomorphological evidence that, in the past, Mars had large amounts of liquid water on its surface - possibly due to a thicker atmosphere. From a biological perspective the existence of liquid water, by itself motivates the question of the origin of life on Mars. One of the martian meteorites dates back to this early period and may contain evidence consistent with Ye. From studies of the Earth's earliest biosphere we know that by 3.5 Gyr. ago, life had originated on Earth and reached a fair degree of biological sophistication. Surface activity and erosion on Earth make it difficult to trace the history of life before the 3.5 Gyr timeframe. Ecosystems in cold, dry locations on Earth - such as the Antarctic provide examples of how life on Mars might have survived and where to look for fossils.

Author

Ecosystems; Extraterrestrial Life; Mars Surface

MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

Includes general topics and overviews related to mathematics and computer science. For specific topics in these areas see categories 60 through 67.

20010077907 Rutherford Appleton Lab., Computational Science and Engineering Dept., Chilton, UK

Componentwise Fast Convergence in the Solution of Full-Rank Systems of Nonlinear Equations

Gould, N. I. M.; Orban, D.; Sartenaer, A.; Toint, P. L.; Oct. 03, 2000; 24p; In English

Report No.(s): PB2001-105864; RAL-TR-2000-040; Copyright; Avail: National Technical Information Service (NTIS)

The asymptotic convergence of parameterized variants of Newton's method for the solution of nonlinear systems of equations is considered. The original system is perturbed by a term involving the variables and a scalar parameter which is driven to zero as the iteration proceeds. The exact local solutions to the perturbed systems then form a differentiable path leading to a solution of the original system, the scalar parameter determining the progress along the path. A homotopy-type algorithm, which involves an inner iteration in which the perturbed systems are approximately solved, is outlined. It is shown that asymptotically, a single linear system is solved per update of the scalar parameter. It turns out that a componentwise Q-superlinear rate may be attained under standard assumptions, and that this rate may be made arbitrarily close to quadratic. Numerical experiments illustrate the results and the authors discuss the relationship that this method shares with interior methods in constrained optimization.

NTIS

Homotopy Theory; Convergence; Algebra; Nonlinear Systems; Linear Systems

20010078206 Helsinki Univ. of Technology, Lab. for Theoretical Computer Science, Espoo, Finland

Detecting and Exploiting Data Type Symmetries of Algebraic System Nets During Reachability Analysis

Junttila, T.; 1999; ISSN 0783-5396; 82p; In English

Report No.(s): PB2001-105961; HUT-TCS-A57; ISBN 951-72-4885-9; Copyright; Avail: National Technical Information Service (NTIS)

The symmetry reduction method in a technique designed to alleviate the combinatorial state space explosion problem by exploiting the symmetries of state spaces. This work describes a way how state space symmetries of a high-level Petri net formalism, algebraic system nets, can be detected and exploited during the reachability analysis. The main idea is that permuting the domains of data types used in nets produces corresponding permutations in the state space level.

NTIS

Algebra; Petri Nets; Symmetry; Combinatorial Analysis

20010079195 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Periods

Kontsevich, M.; Zagier, D.; May 2001; 44p; In English

Report No.(s): PB2001-106887; IHES/M/01/22; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Periods is the generic term used to designate the numbers arising as integrals of algebraic functions over domains described by algebraic equations or inequalities with coefficients in \mathbb{Q} . This class of numbers, far larger and more mysterious than the ring of algebraic numbers, is nevertheless accessible in the sense that its elements are constructible and that one at least conjecturally has a way to verify the equality of any two numbers which have been expressed as periods. Most of the important constants of mathematics belong to the class of periods, and these numbers play a critical role in the theory of differential equations, in transcendence theory, and in many of the central conjectures of modern arithmetical algebraic geometry. The paper gives a survey of some of these connections, with an emphasis on explicit examples and on open questions.

NTIS

Algebra; Functions (Mathematics); Inequalities; Integrals

20010082533 NASA Dryden Flight Research Center, Edwards, CA USA

User's Guide for SKETCH

Hedgley, David R., Jr., NASA Dryden Flight Research Center, USA; December 2000; 72p; In English; CD-ROM contains full text document in PDF or Microsoft Word format

Report No.(s): NASA/TM-2000-210388; H-2411; NAS 1.15:210388; NONP-NASA-CD-2001136519; No Copyright; Avail: CASI; C01, CD-ROM; A04, Hardcopy; A01, Microfiche

A user's guide for the computer program SKETCH is presented on this disk. SKETCH solves a popular problem in computer graphics-the removal of hidden lines from images of solid objects. Examples and illustrations are included in the guide. Also included is the SKETCH program, so a user can incorporate the information into a particular software system.

Author

User Manuals (Computer Programs); Computer Programs; Computer Graphics; Disks

60

COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware and data processing. For components see 33 Electronics and Electrical Engineering. For computer vision see 63 Cybernetics, Artificial Intelligence and Robotics.

20010082344 Naval Air Systems Command, Patuxent River, MD USA

Avoiding Obsolescence with a Low Cost Scalable Fault-Tolerant Computer Architecture

Schaff, Josef, Naval Air Systems Command, USA; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 20-1 - 20-6; In English; See also 20010082326; Copyright Waived; Avail: CASI; A02, Hardcopy

This new computer architecture can use anything from COTS (Commercial Off-The-Shelf) microcontrollers to the latest high-end processors. It is a distributed fault-tolerant architecture that is dynamically reconfigurable in the event of device failures, and is fully programmable in conventional high level languages. by using a simple two-level hierarchy with redundant control processors that configure the I/O (Input/Output) processor arrangement, even the failure of several processors will have no effect on data. An example is given of a realtime data acquisition system with a total cost for a 16 channel device with mixed sync/async and proprietary baud rates, of less than \$500 in parts. This example system can be reconfigured to any arrangement of 16 or less serial interfaces. The architecture is flexible and can be expanded into two levels: status, health and monitoring; and clustered I/O and processing. Additional expansion to a third level would add adaptive learning aspects. Each processor can be dynamically removed or replaced, and is designed to run a minimal amount of processor-specific software about 1-2 kilobytes of code, which allows each new type of processor added to be configured to respond as a generic processor/CPU (Central Processing Unit). This facilitates the addition of new processors with a minimal amount of development. Present software may need to be modified to take full advantage of this architecture, although by using currently available distributed processor operating systems, most of the modifications can be avoided. The layout of the architecture allows both obsolete and state-of-the-art processors to work together, and transparent replacement of obsolete processors with newer ones. Some current software design methodologies can be applied to configuring the hardware architecture, such as CORBA - The architecture lends easily to Object Request Brokers - e.g., cluster CPU replacements can be specified by using Interface Definition Language-type description of CPU functionality, making it CORBA-like from a hardware perspective. Further development and acceptance of this architecture can lead to significant cost savings and mitigate obsolescence in future computer design.

Author

Architecture (Computers); Fault Tolerance; Software Engineering

61

COMPUTER PROGRAMMING AND SOFTWARE

Includes software engineering, computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. For computer software applied to specific applications, see also the associated category.

20010077969 NASA Ames Research Center, Moffett Field, CA USA

Information Virtualization in Virtual Environments

Bryson, Steve, NASA Ames Research Center, USA; [2000]; 25p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Virtual Environments provide a natural setting for a wide range of information visualization applications, particularly where the information to be visualized is defined on a three-dimensional domain (Bryson, 1996). This chapter provides an overview of the issues that arise when designing and implementing an information visualization application in a virtual environment. Many design issues that arise, such as, e.g., issues of display, user tracking are common to any application of virtual environments. In

this chapter we focus on those issues that are special to information visualization applications, as issues of wider concern are addressed elsewhere in this book.

Author

Data Processing; Environment Effects; Display Devices

20010078918 NASA Marshall Space Flight Center, Huntsville, AL USA

Determining the Mass Density Along Magnetic Field Lines from Toroidal Eigenfrequencies

Denton, R., NASA Marshall Space Flight Center, USA; Gallagher, D. L., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Toroidal eigenfrequencies can be used to remotely sense the equatorial mass density ρ_{eq} and the density dependence along a magnetic field line. Here we present improvements to the method of Schulz [1996], which allows ρ_{eq} and the power law index α (for mass density along a field line proportional to R^{α}), where R is the radial distance from the center of the Earth) to be determined from the y intercept and slope of a plot of toroidal frequency versus toroidal harmonic number n . Our modifications include a model form for eigenfrequencies with a fractional precision of 0.0005 for $-6 \leq \alpha \leq 6$ and $2 \leq L \leq 8$ (accuracy is doubtful beyond $L = 5$) and an iterative procedure for getting more accurate results than those found using Schulz's method. In addition, we do an analysis of the effect of random measurement errors. Observed frequencies need to be accurate to approx. 6% (3%) of the fundamental frequency in order to determine ρ_{eq} (α) to a precision of 30% (unity). We then apply our method to data generated using the Global Core Plasma Model for plasmaspheric mass density; our analysis demonstrates clearly how the α index represents the mass density dependence on the outer part of the field line (R/LR_E) greater than or approx. 2/3).

Author

Magnetic Fields; Toroidal Plasmas; Frequencies; Density (Mass/Volume)

20010079077 NASA Ames Research Center, Moffett Field, CA USA

Virtual Planning at Work: A Tour of NASA Future Flight Central

McClenahan, Jim, NASA Ames Research Center, USA; [2000]; 4p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

FutureFlight Central will permit integration of tomorrow's technologies in a risk-free simulation of any airport, airfield, and tower cab environment. The facility provides an opportunity for airlines to mitigate passenger delays by fine tuning airport hub operations, gate management and ramp movement procedures. It also allows airport managers an opportunity to study effects of various improvements at their airports. Finally, it enables air traffic controllers to provide feedback and to become familiar with new airport operations and technologies before final installation.

Author

Air Traffic Controllers (Personnel); Airline Operations; Feedback; Management Methods; Simulation

20010079830 NASA Goddard Space Flight Center, Greenbelt, MD USA

Image2000: A Free, Innovative, Java Based Imaging Package

Pell, Nicholas, Commerce One eGovernment Solutions, Inc., USA; Wheeler, Phil, Commerce One eGovernment Solutions, Inc., USA; Cornwell, Carl, Commerce One eGovernment Solutions, Inc., USA; Matusow, David, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; Space 2000, 17-21 Mar. 2002, NM, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The National Aeronautics and Space Administration (NASA) Goddard Space Flight Center's (GSFC) Scientific and Educational Endeavors (SEE) and the Center for Image Processing in Education (CIPE) use satellite image processing as part of their science lessons developed for students and educators. The image processing products that they use, as part of these lessons, no longer fulfill the needs of SEE and CIPE because these products are either dependent on a particular computing platform, hard to customize and extend, or do not have enough functionality. SEE and CIPE began looking for what they considered the "perfect" image processing tool that was platform independent, rich in functionality and could easily be extended and customized for their purposes. At the request of SEE, NASA's GSFC, code 588 the Advanced Architectures and Automation Branch developed a powerful new Java based image processing endeavors.

Author

Image Processing; Java (Programming Language); Education; Satellite Imagery

20010079943 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK

Specifying and Verifying Real-Time Systems Using Second-Order Algebraic Methods: A Case Study of the Railroad Crossing Controller

Steggles, L. J.; Jul. 2000; 26p

Report No.(s): PB2001-106872; CS-TR-697; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Second-order algebraic methods provide a natural and expressive formal framework in which to develop correct computing systems. In this paper we consider using second-order algebraic methods to specify real-time systems and to verify their associated safety and utility properties. We provide a simple methodology for the design of correct real-time systems based on the notion of functional refinement. We demonstrate our ideas by presenting a detailed case study of the railroad crossing controller, a benchmark example in the real-time systems community. This case study demonstrates how real-time constraints can be modeled naturally using second-order algebras and illustrates the substantial expressive power of second-order equations.

NTIS

Algebra; Real Time Operation; Rail Transportation; Crossings; Architecture (Computers); Active Control

20010081055 Computational Physics, Inc., Springfield, VA USA

Photochemical Phenomenology Model for the New Millennium Annual Report, Period ending Aug. 2001

Bishop, James, Computational Physics, Inc., USA; Evans, J. Scott, Computational Physics, Inc., USA; Aug. 21, 2001; 8p; In English

Contract(s)/Grant(s): NASW-99032

Report No.(s): Rept-5108-8; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The "Photochemical Phenomenology Model for the New Millennium" project tackles the issue of reengineering and extension of validated physics-based modeling capabilities ("legacy" computer codes) to application-oriented software for use in science and science-support activities. While the design and architecture layouts are in terms of general particle distributions involved in scattering, impact, and reactive interactions, initial Photochemical Phenomenology Modeling Tool (PPMT) implementations are aimed at construction and evaluation of photochemical transport models with rapid execution for use in remote sensing data analysis activities in distributed systems. Current focus is on the Composite Infrared Spectrometer (CIRS) data acquired during the CASSINI flyby of Jupiter. Overall, the project has stayed on the development track outlined in the Year 1 annual report and most Year 2 goals have been met. The issues that have required the most attention are: implementation of the core photochemistry algorithms; implementation of a functional Java Graphical User Interface; completion of a functional CORBA Component Model framework; and assessment of performance issues. Specific accomplishments and the difficulties encountered are summarized in this report. Work to be carried out in the next year center on: completion of testing of the initial operational implementation; its application to analysis of the CASSINI/CIRS Jovian flyby data; extension of the PPMT to incorporate additional phenomenology algorithms; and delivery of a mature operational implementation.

Author

Photochemical Reactions; Phenomenology; Applications Programs (Computers); Infrared Spectrometers; Computer Programs

20010081056 NASA Ames Research Center, Moffett Field, CA USA

Using Runtime Analysis to Guide Model Checking of Java Programs

Havelund, Klaus, RECOM Technologies, Inc., USA; [2000]; 20p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes how two runtime analysis algorithms, an existing data race detection algorithm and a new deadlock detection algorithm, have been implemented to analyze Java programs. Runtime analysis is based on the idea of executing the program once, and observing the generated run to extract various kinds of information. This information can then be used to predict whether other different runs may violate some properties of interest, in addition of course to demonstrate whether the generated run itself violates such properties. These runtime analyses can be performed stand-alone to generate a set of warnings. It is furthermore demonstrated how these warnings can be used to guide a model checker, thereby reducing the search space. The described techniques have been implemented in the b e grown Java model checker called PathFinder.

Author

Java (Programming Language); Program Verification (Computers)

20010081187 NASA Ames Research Center, Moffett Field, CA USA

Supercomputing Aspects for Simulating Incompressible Flow

Kwak, Dochan, NASA Ames Research Center, USA; Kris, Cetin C., Eloret Corp., USA; [2000]; 2p; In English; CFD for 21st Century, 15-17 Jul. 2000, Kyoto, Japan; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The primary objective of this research is to support the design of liquid rocket systems for the Advanced Space Transportation System. Since the space launch systems in the near future are likely to rely on liquid rocket engines, increasing the efficiency and reliability of the engine components is an important task. One of the major problems in the liquid rocket engine is to understand fluid dynamics of fuel and oxidizer flows from the fuel tank to plume. Understanding the flow through the entire turbo-pump geometry through numerical simulation will be of significant value toward design. One of the milestones of this effort is to develop, apply and demonstrate the capability and accuracy of 3D CFD methods as efficient design analysis tools on high performance computer platforms. The development of the Message Passage Interface (MPI) and Multi Level Parallel (MLP) versions of the INS3D code is currently underway. The serial version of INS3D code is a multidimensional incompressible Navier-Stokes solver based on overset grid technology, INS3D-MPI is based on the explicit message-passing interface across processors and is primarily suited for distributed memory systems. INS3D-MLP is based on multi-level parallel method and is suitable for distributed-shared memory systems. For the entire turbo-pump simulations, moving boundary capability and efficient time-accurate integration methods are built in the flow solver, to handle the geometric complexity and moving boundary problems, an overset grid scheme is incorporated with the solver so that new connectivity data will be obtained at each time step. The Chimera overlapped grid scheme allows subdomains move relative to each other, and provides a great flexibility when the boundary movement creates large displacements. Two numerical procedures, one based on artificial compressibility method and the other pressure projection method, are outlined for obtaining time-accurate solutions of the incompressible Navier-Stokes equations. The performance of the two methods is compared by obtaining unsteady solutions for the evolution of twin vortices behind a flat plate. Calculated results are compared with experimental and other numerical results. For an unsteady flow, which requires small physical time step, the pressure projection method was found to be computationally efficient since it does not require any subiteration procedure. It was observed that the artificial compressibility method requires a fast convergence scheme at each physical time step in order to satisfy the incompressibility condition. This was obtained by using a GMRES-ILU(0) solver in present computations. When a line-relaxation scheme was used, the time accuracy was degraded and time-accurate computations became very expensive.

Derived from text

Computational Fluid Dynamics; Computational Grids; Design Analysis; Distributed Memory; Supercomputers; Liquid Propellant Rocket Engines

20010081322 NASA Ames Research Center, Moffett Field, CA USA

Verification of Plan Models Using UPPAAL

Khatib, Lina, QSS Group, Inc., USA; Muscettola, Nicola, NASA Ames Research Center, USA; Haveland, Klaus, RECOM Technologies, Inc., USA; [2001]; 11p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes work on the verification of HSTS, the planner and scheduler of the Remote Agent autonomous control system deployed in Deep Space 1 (DS1). The verification is done using UPPAAL, a real time model checking tool. We start by motivating our work in the introduction. Then we give a brief description of HSTS and UPPAAL. After that, we give a mapping of HSTS models into UPPAAL and we present samples of plan model properties one may want to verify. Finally, we conclude with a summary.

Author

Real Time Operation; Remote Control; Scheduling

20010081595 Veridian-MRJ Technology Solutions, Moffett Field, CA USA

DMFS: A Data Migration File System for NetBSD

Studenmund, William, Veridian-MRJ Technology Solutions, USA; [2000]; 16p; In English; USENIX 2000, Jun. 2000, San Diego, CA, USA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

I have recently developed DMFS, a Data Migration File System, for NetBSD. This file system provides kernel support for the data migration system being developed by my research group at NASA/Ames. The file system utilizes an underlying file store to provide the file backing, and coordinates user and system access to the files. It stores its internal metadata in a flat file, which resides on a separate file system. This paper will first describe our data migration system to provide a context for DMFS, then it will describe DMFS. It also will describe the changes to NetBSD needed to make DMFS work. Then it will give an overview of the file archival and restoration procedures, and describe how some typical user actions are modified by DMFS. Lastly, the paper will present simple performance measurements which indicate that there is little performance loss due to the use of the DMFS layer.

Author

Data Management; File Maintenance (Computers); Computer Programs

20010081822 Advanced Management Technology, Inc., Moffett Field, CA USA

The Design of a Templated C++ Small Vector Class for Numerical Computing

Moran, Patrick J., Advanced Management Technology, Inc., USA; Jun. 20, 2000; 30p; In English

Contract(s)/Grant(s): DTTS59-99-D00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We describe the design and implementation of a templated C++ class for vectors. The vector class is templated both for vector length and vector component type; the vector length is fixed at template instantiation time. The vector implementation is such that for a vector of N components of type T, the total number of bytes required by the vector is equal to $N * \text{size of } (T)$, where size of is the built-in C operator. The property of having a size no bigger than that required by the components themselves is key in many numerical computing applications, where one may allocate very large arrays of small, fixed-length vectors. In addition to the design trade-offs motivating our fixed-length vector design choice, we review some of the C++ template features essential to an efficient, succinct implementation. In particular, we highlight some of the standard C++ features, such as partial template specialization, that are not supported by all compilers currently. This report provides an inventory listing the relevant support currently provided by some key compilers, as well as test code one can use to verify compiler capabilities.

Author

C++ (Programming Language); Numerical Analysis; Computation; Templates

20010082217 NASA Ames Research Center, Moffett Field, CA USA

The Future of the Internet in Science

Guice, Jon, NASA Ames Research Center, USA; Duffy, Robert, NASA Ames Research Center, USA; [2000]; 23p; In English; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

How are scientists going to make use of the Internet several years from now? This is a case study of a leading-edge experiment in building a 'virtual institute'-- using electronic communication tools to foster collaboration among geographically dispersed scientists. Our experience suggests: Scientists will want to use web-based document management systems. There will be a demand for Internet-enabled meeting support tools. While internet videoconferencing will have limited value for scientists, webcams will be in great demand as a tool for transmitting pictures of objects and settings, rather than "talking heads." and a significant share of scientists who do fieldwork will embrace mobile voice, data and video communication tools. The setting for these findings is a research consortium called the NASA Astrobiology Institute.

Author

Data Transmission; Internets; Management Systems; Video Communication

20010082322 Science Applications International Corp., Tucson, AZ USA

Scan-Based Implementation of JPEG 2000 Extensions

Rountree, Janet C., Science Applications International Corp., USA; Webb, Brian N., Science Applications International Corp., USA; Flohr, Thomas J., Science Applications International Corp., USA; Marcellin, Michael W., Arizona Univ., USA; [2001]; 6p; In English

Contract(s)/Grant(s): NAS5-00186; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

JPEG 2000 Part 2 (Extensions) contains a number of technologies that are of potential interest in remote sensing applications. These include arbitrary wavelet transforms, techniques to limit boundary artifacts in tiles, multiple component transforms, and trellis-coded quantization (TCQ). We are investigating the addition of these features to the low-memory (scan-based) implementation of JPEG 2000 Part 1. A scan-based implementation of TCQ has been realized and tested, with a very small performance loss as compared with the full image (frame-based) version. A proposed amendment to JPEG 2000 Part 2 will effect the syntax changes required to make scan-based TCQ compatible with the standard.

Author

Transformations (Mathematics); Wavelet Analysis; Remote Sensing; Technology Assessment

20010082336 Virtual Prototypes, Inc., Oklahoma City, OK USA

Commercial Off-the-Shelf Software and Simulation Tools

Veitch, William A., Virtual Prototypes, Inc., USA; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 11-1 - 11-5; In English; See also 20010082326; Original contains color illustrations; Copyright Waived; Avail: CASI; A01, Hardcopy

In this paper the author will present the arguments supporting the case for using Commercial Off-the-Shelf Software and Simulation Tools (COSST) in major defense systems, whether for actual combat, or for embedded training purposes. Whether the objective is a service life extension, new development, or an upgrade to certain system level functions and operations, COSST

have come to represent the solution when budgets and time scales are tight and engineering staff are becoming harder to come by. The author will describe how his company's tools have been layered over the engineering, simulation, test and analysis processes at major defense firms to improve reuse, assist in knowledge capture, and to produce results in major weapons systems programs.

Author

Commercial Off-The-Shelf Products; Weapon Systems; Applications Programs (Computers); Technology Utilization

20010082347 BAE Systems, Edinburgh UK

Adopting New Software Development Techniques to Reduce Obsolescence

Lane, C. H. R., BAE Systems, UK; Beattie, E. S., BAE Systems, UK; Chita, J. S., BAE Systems, UK; Lincoln, S. P., BAE Systems, UK; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 23-1 - 23-9; In English; See also 20010082326; Original contains color illustrations; Copyright Waived; Avail: CASI; A02, Hardcopy

This paper reports on the advanced techniques employed in the specification of software requirements and the subsequent software development for an E-Scan demonstrator Radar Data Processor. This involves the Rapid Object-oriented Process for Embedded Systems (ROPES), UML syntax, object-oriented design, and automatic code generation and test. The commercial off-the-shelf (COTS) technology reported is in terms of commercially available state of the art method and tool support for the software analysis and design. The resulting software product contains a significant proportion of COTS code resulting from the code-generation. We are also using automation in development of our MMI, a COTS GUI-builder, and COTS hardware and operating system. In this paper we also report on the object-oriented method, using the ROPES process, together with information about how in practice we are implementing the theory. We present the structure of the software and how it relates to the application under development. With these techniques there are significant reductions in obsolescence due to: (1) customer visibility and understanding of the product under procurement, making clear the advantages and limitations of what will be produced; (2) development of a coherent, consistent, and maintainable system specification; (3) use of use an industry-standard model notation (UML) to capture the analysis and design, enabling portability of the design to other tools and products; (4) flexibility in catering for evolving requirements; (5) development of testable requirements, enabling original functionality to be re-checked after addition of enhancements; (6) techniques for enabling the re-use or replacement of modules with defined interfaces; (7) easy and maintainable connections between specification and implementation; and (8) high initial quality and low rework costs. This paper will be of benefit to those just embarking on system and software development, or considering updating processes in a legacy project. It is also applicable to those just embarking on choice of tools and methods for initiating programs as well as for early feasibility studies.

Author

Computer Programs; Object-Oriented Programming; Requirements; Technology Utilization

20010082351 Defence Evaluation Research Agency, Systems and Software Engineering Centre, Malvern, UK

Software COTS Components: Problems and Solutions?

Dowling, Ted, Defence Evaluation Research Agency, UK; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 28-1 - 28-8; In English; See also 20010082326; Copyright Waived; Avail: CASI; A02, Hardcopy

Commercial off-the-shelf (COTS) components offer a solution to many obsolescence problems, but certain COTS items can also introduce their own difficulties. Commercial operating systems, for example, play a key system role but are single-source and black box, denying the user both the visibility and control of a bespoke item. Open source software in general, but the Linux operating system in particular, seems to offer many of the advantages of COTS but with the added benefit of full access to the source code. However, the widespread adoption of Linux presents not only opportunities but some potential difficulties, for which a possible solution is a dedicated focus within the defense community.

Author

Commercial Off-The-Shelf Products; Operating Systems (Computers)

20010082520 Rutherford Appleton Lab., Computational Science and Engineering Dept., Chilton, UK

Multilevel Algorithms for Wavefront Reduction

Hu, Y. F.; Scott, J. A.; Sep. 18, 2000; ISSN 1358-6254; 38p; In English

Report No.(s): PB2001-105858; RAL-TR-2000-031; Copyright; Avail: National Technical Information Service (NTIS)

Multilevel algorithms are proposed for reordering sparse symmetric matrices to reduce the wavefront and profile. A graph representation of the matrix is used and two graph coarsening methods are investigated. A multilevel algorithm that uses a maximal independent vertex set for coarsening and the Sloan algorithm on the coarsest graph is shown to produce orderings that

are of a similar quality to those obtained using the best existing combinatorial algorithm (the hybrid Sloan algorithm). Advantages of the proposed algorithm over the hybrid Sloan algorithm are that it does not require any spectral information and is significantly faster, requiring on average half the CPU time.

NTIS

Algorithms; Wave Fronts; Reduction

20010082908 NASA Ames Research Center, Moffett Field, CA USA

An Overview of NASA's Intelligent Systems Program

Cooke, Daniel E., NASA Ames Research Center, USA; [2001]; 6p; In English; IEEE Aerospace Conferences, Unknown; Sponsored by Institute of Electrical and Electronics Engineers, USA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

NASA and the Computer Science Research community are poised to enter a critical era. An era in which - it seems - that each needs the other. Market forces, driven by the immediate economic viability of computer science research results, place Computer Science in a relatively novel position. These forces impact how research is done, and could, in worst case, drive the field away from significant innovation opting instead for incremental advances that result in greater stability in the market place. NASA, however, requires significant advances in computer science research in order to accomplish the exploration and science agenda it has set out for itself. NASA may indeed be poised to advance computer science research in this century much the way it advanced aero-based research in the last.

Author

NASA Programs; Artificial Intelligence

63

CYBERNETICS, ARTIFICIAL INTELLIGENCE AND ROBOTICS

Includes feedback and control theory, information theory, machine learning, and expert systems. For related information see also 54 Man/System Technology and Life Support.

20010082937 Glamorgan Univ., Pontypridd, School of Technology, Glamorgan, UK

The Development of a Neural Network Based Monitoring and Control System for Biological Wastewater Treatment Systems

Esteves, S. R. R., Glamorgan Univ., Pontypridd, UK; Wilcox, S. J., Glamorgan Univ., Pontypridd, UK; Hawkes, D. L., Glamorgan Univ., Pontypridd, UK; O'Neill, C., Glamorgan Univ., Pontypridd, UK; Hawkes, F. R., Glamorgan Univ., Pontypridd, UK; International Journal of COMADEM; July 2001; ISSN 1363-7681; Volume 4, No. 3, pp. 22-28; In English

Contract(s)/Grant(s): ENV4-CT95-0064; Copyright; Avail: Issuing Activity

A series of experiments under varying loading conditions, using a 30 I Up-flow Anaerobic Sludge Blanket (UASR) reactor and a 20 I aerobic vessel, was performed using a simulated textile effluent (STE). The acquired data was used in the training and testing of three control strategies. The systematic experiments varied both the organic load and dye concentration in a series of step changes, with the objective of the control schemes being to ensure optimal operation of the reactor during changes in load. The results proved that a hybrid structure containing a Kohonen or Self Organizing Map (SOM) followed by a series of backpropagation networks was the most efficient at dealing with different load conditions whilst being least influenced by sensor loss.

Author

Effluents; Neural Nets; Microorganisms; Water Treatment; Control Theory

64

NUMERICAL ANALYSIS

Includes iteration, differential and difference equations, and numerical approximation.

20010080473 Boeing Commercial Airplane Group, Seattle, WA USA

Young-Person's Guide to Detached-Eddy Simulation Grids

Spalart, Philippe R., Boeing Commercial Airplane Group, USA; July 2001; 23p; In English

Contract(s)/Grant(s): NAS1-97040; RTOP 706-81-13-02

Report No.(s): NASA/CR-2001-211032; NAS 1.26:211032; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We give the "philosophy", fairly complete instructions, a sketch and examples of creating Detached-Eddy Simulation (DES) grids from simple to elaborate, with a priority on external flows. Although DES is not a zonal method, flow regions with widely different gridding requirements emerge, and should be accommodated as far as possible if a good use of grid points is to be made. This is not unique to DES. We brush on the time-step choice, on simple pitfalls, and on tools to estimate whether a simulation is well resolved.

Author

Computational Grids; Large Eddy Simulation; Turbulent Flow

20010081061 Institute for Computer Applications in Science and Engineering, Hampton, VA USA

A Local Discontinuous Galerkin Method for KdV-type Equations Final Report

Yan, Jue, Brown Univ., USA; Shu, Chi-Wang, Brown Univ., USA; June 2001; 28p; In English

Contract(s)/Grant(s): NAS1-97046; NCC1-01035; DAAD19-00-1-0405; F49620-99-1-0077; NSF DMS-98-04985; NSF ECS-99-06606; RTOP 505-90-52-01

Report No.(s): NASA/CR-2001-211026; NAS 1.26:211026; ICASE-2001-20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper we develop a local discontinuous Galerkin method for solving KdV type equations containing third derivative terms in one and two space dimensions. The method is based on the framework of the discontinuous Galerkin method for conservation laws and the local discontinuous Galerkin method for viscous equations containing second derivatives, however the guiding principle for inter-cell fluxes and nonlinear stability is new. We prove L2 stability and a cell entropy inequality for the square entropy for a class of nonlinear PDEs of this type both in one and multiple spatial dimensions, and give an error estimate for the linear cases in the one dimensional case. The stability result holds in the limit case when the coefficients to the third derivative terms vanish, hence the method is especially suitable for problems which are "convection dominate", i.e. those with small second and third derivative terms. Numerical examples are shown to illustrate the capability of this method. The method has the usual advantage of local discontinuous Galerkin methods, namely it is extremely local and hence efficient for parallel implementations and easy for h-p adaptivity.

Author

Galerkin Method; Korteweg-Devries Equation; Nonlinearity; Error Analysis; Conservation Laws

65

STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; time series and analysis; and stochastic processes.

20010078212 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Note on Bidifferential Calculi and Bihamiltonian Systems

Guha, P.; Sep. 2000; 9p; In English

Report No.(s): PB2001-105841; IHES/M/00/64; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In this note the authors discuss the geometrical relationship between bi-Hamiltonian systems and bi-differential calculi, introduced by Dimakis and Moller-Hoissen.

NTIS

Calculi; Hamiltonian Functions

20010078213 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Hamiltonian Algebroid Symmetries in W-Gravity and Poisson Sigma-Model

Levin, A. M.; Olshanetsky, M. A.; Oct. 2000; 32p; In English

Report No.(s): PB2001-105139; IHES/P/00/69; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Starting from a Lie algebroid α over a space ψ the authors lift its action to the canonical transformations on the principle affine bundle R over the contangent bundle $\tau(\psi)$. Such lifts are classified by the first cohomology $H^1(\alpha)$. The resulting object is the Hamiltonian algebroid $\alpha(\eta)$ over R with the anchor map from $\Gamma(\alpha(\eta))$ to Hamiltonians of canonical transformations. Hamiltonian algebroids generalize the Lie algebras of canonical transformations.

NTIS

Hamiltonian Functions; Lie Groups; Symmetry; Mathematical Models; Homology

20010079944 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle UK

Statistical Fairness of Ordered Arbiters

Madalinski, A.; Bystrov, A.; Yakovlev, A.; Jul. 2000; 54p

Report No.(s): PB2001-106871; CS-TR-703; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

A new parameter of quantity fairness, or statistical fairness, describing behavior of asynchronous arbiters is introduced. It takes into account timing parameters of the arbiter and its environment described as stochastic processes. In this context a traditional quality of fairness can be understood as a condition of having the probability of request serving equal to one under a uniform delay distribution in the range between 0 and infinity. Thus the new parameter can be treated as a generalization of the common approach.

NTIS

Probability Theory; Stochastic Processes; Synchronism

67

THEORETICAL MATHEMATICS

Includes algebra, functional analysis, geometry, topology set theory, group theory and and number theory.

20010077897 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Multiple (zeta)-Values, Galois Groups, and Geometry of Modular Varieties

Goncharov, A. B.; Aug. 2000; 35p; In English

Report No.(s): PB2001-105135; IHES/M/OO/54; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The authors discuss two arithmetical problems, at first glance unrelated: (1) The properties of the multiple sigma-values; (2) The action of the absolute Galois group on the pro-l completion of the fundamental group. These problems are the Hodge and l-adic sites of the following one: (3) Study the Lie algebra of the image of motivic Galois group acting on the motivic fundamental group. The authors will discuss a suprising connection between these problems and geometry of the modular varieties.

NTIS

Algebra; Arithmetic; Group Theory

20010079942 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Towards Lower Bounds for Complexity of 3-Manifolds: A Program

Anisov, S.; Mar. 2001; 50p; In English; Portions of this document are not fully legible

Report No.(s): PB2001-106898; IHES/M/01/13; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

For a 3-dimensional manifold M sup 3, its complexity $c(M$ sup 3), introduced by S. Matveev, is the minimal number of vertices of an almost simple spine of M sup 3; in many cases it is equal to the minimal number of tetrahedra in a singular triangulation of M 3. An approach to estimating $c(M$ sup 3) from below for total spaces of torus bundles over s^1 , based on the study of theta curves in the fibers, is developed, and pseudominimal special spines for these manifolds are constructed, which we conjecture to be their minimal spines. We also show how to apply some of these ideas to other 3-manifolds.

NTIS

Manifolds (Mathematics); Curves (Geometry); Three Dimensional Models

20010081323 Computer Sciences Corp., Moffett Field, CA USA

Using Minimum-Surface Bodies for Iteration Space Partitioning

Frumlin, Michael, NASA Ames Research Center, USA; VanderWijngaart, Rob F., Computer Sciences Corp., USA; [2001]; 11p; In English; Tenth SIAM Conference on Parallel Processing for Scientific Computing, Mar. 2001, USA; Sponsored by Society for Industrial and Applied Mathematics, USA

Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A number of known techniques for improving cache performance in scientific computations involve the reordering of the iteration space. Some of these reorderings can be considered as coverings of the iteration space with the sets having good surface-to-volume ratio. Use of such sets reduces the number of cache misses in computations of local operators having the iteration space as a domain. We study coverings of iteration spaces represented by structured and unstructured grids. For structured grids we introduce a covering based on successive minima tiles of the interference lattice of the grid. We show that the covering has good surface-to-volume ratio and present a computer experiment showing actual reduction of the cache misses achieved by using these tiles. For unstructured grids no cache efficient covering can be guaranteed. We present a triangulation of a

3-dimensional cube such that any local operator on the corresponding grid has significantly larger number of cache misses than a similar operator on a structured grid.

Author

Iteration; Computation; Operators (Mathematics); Surface Reactions

20010082942 Rice Univ., Dept. of Chemistry, Houston, TX USA

What is the Best Alternative to Diagonalization of the Hamiltonian in Large Scale Semiempirical Calculations?

Daniels, Andrew D., Rice Univ., USA; Scuseria, Gustavo E., Rice Univ., USA; Journal of Chemical Physics; Jan. 15, 1999; ISSN 0021-9606; Volume 10, No. 3, pp. 1321-1327; In English

Contract(s)/Grant(s): NSF CHE-96-18323; NAG2-1112; NLM-LM07093; Copyright; Avail: Issuing Activity

Recently, several linear scaling approaches have been introduced which replace the time dominating diagonalization step in semiempirical methods, enabling practical calculations to be performed, on very large molecules. This paper compares the accuracy and performance of pseudodiagonalization (PD), conjugate gradient density matrix search (CG-DMS), the Chebyshev polynomial expansion method (CEM), and purification of the density matrix (PDM) as linear scaling substitutions for diagonalization. The scaling, speed, and reliability of these methods are compared for AMI single point energy calculations on polyglycine chains (up to 20,000 atoms), water clusters (up to 12,300 atoms), and nucleic acids (up to 6300 atoms).

Author

Chebyshev Approximation; Conjugate Gradient Method; Accuracy; Hamiltonian Functions; Matrices (Mathematics)

70

PHYSICS (GENERAL)

Includes general research topics related to mechanics, kinetics, magnetism, and electrodynamics. For specific areas of physics see categories 71 through 77. For related instrumentation see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

20010081884 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

A 6-D Brane World Model

Kanti, P.; Madden, R.; Olive, K. A.; Apr. 2001; 30p; In English; Portions of this document are not fully legible Report No.(s): PB2001-106894; IHES/P/01/16; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The authors consider a 6D space-time which is periodic in one of the extra dimensions and compact in the other. The periodic direction is defined by two 4-brane boundaries. Both static and non-static exact solutions, in which the internal spacetime has constant radius of curvature, are derived. In the case of static solutions, the brane tensions must be tuned as in the 5D Randall-Sundrum model, however, no additional fine-tuning is necessary between the brane tensions and the bulk cosmological constant. By further relaxing the sole fine-tuning of the model, we derive non-static solution, describing de Sitter or Anti de Sitter 4D spacetimes, that allow for the fixing of the inter-brane distance and the accommodations of pairs of positive-negative and positive-positive tension branes. Finally, we consider the stability of the radion field in these configurations by employing small, time-dependent perturbations around the background solutions. In analogy with results drawn in 5 dimensions, the solutions describing a de Sitter 4D spacetime turn out to be unstable while those describing an Anti de Sitter geometry are shown to be stable.

NTIS

Solutions; Space-Time Functions

20010081935 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Dimensional Regularization of the Gravitational Interaction of Point Masses

Damour, T.; Jaranowski, P.; Schaefer, G.; May 11, 2001; 14p; In English; Portions of this document are not fully legible Report No.(s): PB2001-106896; IHES/P/01/19; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We show how to use dimensional regularization to determine, within the Arnowitt-Deser-Misner canonical formalism, the reduced Hamiltonian describing the dynamics of two gravitationally interacting point masses. Implementing, at the third post-Newtonian (3PN) accuracy, our procedure we find that dimensional continuation yields a finite, unambiguous (no pole part) 3PN Hamiltonian which uniquely determines the heretofore ambiguous 'static' parameter.

NTIS

Gravitational Effects; Field Strength

20010081940 Iowa Univ., Dept. of Physics and Astronomy, Iowa City, IA USA

Alfven Wave Generated Electron Time Dispersion

Kletzing, C. A., Iowa Univ., USA; Hu, S., Iowa Univ., USA; Geophysical Research Letters; Feb. 15, 2001; ISSN 0094-8276; Volume 28, No. 4, pp. 693-696; In English; Original contains color illustrations

Contract(s)/Grant(s): NAGW-5182; NAG5-6525; NSF ATM-98-06868

Report No.(s): Paper-2000GL012179; Copyright; Avail: Issuing Activity

The results from a model of kinetic Alfven waves which includes varying magnetic field and density show that time-dispersed bursts of auroral electrons can be accelerated by Alfven, wave pulses propagating from the magnetosphere to the ionosphere. The modeled electron signatures have similar energy range and temporal structure to those observed on sounding rockets and satellites suggesting that electron time dispersion is generated by Alfven waves.

Author

Magnetic Fields; Wave Dispersion; Time Dependence; Auroras; Magnetohydrodynamic Waves

71

ACOUSTICS

Includes sound generation, transmission, and attenuation. For noise pollution see 45 Environment Pollution. For aircraft noise see also 02 Aerodynamics and 07 Aircraft Propulsion Propulsion and Power.

20010080469 Combustion Research and Flow Technology, Inc., Dublin, PA USA

Flow Solution for Advanced Separate Flow Nozzles Response A: Structured Grid Navier-Stokes Approach *Final Report*

Kenzakowski, D. C., Combustion Research and Flow Technology, Inc., USA; Shipman, J., Combustion Research and Flow Technology, Inc., USA; Dash, S. M., Combustion Research and Flow Technology, Inc., USA; April 2001; 67p; In English; Original contains color illustrations

Contract(s)/Grant(s): NAS3-99098; CRAFT Tech Proj. C069; RTOP 781-30-12

Report No.(s): NASA/CR-2001-210611; E-12571; NAS 1.26:210611; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

NASA Glenn Research Center funded a computational study to investigate the effect of chevrons and tabs on the exhaust plume from separate flow nozzles. Numerical studies were conducted at typical takeoff power with 0.28 M flight speed. Report provides numerical data and insights into the mechanisms responsible for increased mixing.

Author

Plumes; Exhaust Gases; Acoustic Nozzles; Structured Grids (Mathematics); Aeroacoustics

72

ATOMIC AND MOLECULAR PHYSICS

Includes atomic and molecular structure, electron properties, and atomic and molecular spectra. For elementary particle physics see 73 Nuclear Physics.

20010078249 National Inst. of Standards and Technology, Ceramics Div., Gaithersburg, MD USA

Predictive Ionization Cross Section Model for Inorganic Molecules

Hastie, J. W.; Jul. 2001; 46p; In English

Report No.(s): PB2001-107592; NISTIR-6768; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To address a long-standing lack of experimental data for electron impact ionization cross sections for inorganic molecules, or the availability of a reliable predictive method, we have developed a modified classical model. The model relies on the known or expected ionic bonding character of most inorganic and, particularly, of high temperature molecules. Based on isoelectronic analogy, use is made of available cross section data for the elements, together with known or readily calculated ionization potentials for the molecules of interest. Very good agreement is found for several of the species considered here and elsewhere using the more extensive and primarily ab initio binary-encounter Bethe model. Good overall agreement is also found with experimental results for fifty-one species, with up to ten constituent atoms.

NTIS

Ionization Cross Sections; Inorganic Compounds; Electron Impact; Mathematical Models; Thermochemistry; Molecules

20010078910 NASA Marshall Space Flight Center, Huntsville, AL USA

Particle Engulfment and Pushing (PEP): Past Micro-Gravity Experiments and Future Experimental Plan on the International Space Station (ISS)

Sen, Subhayu, Universities Space Research Association, USA; Stefanescu, Doru M., Alabama Univ., USA; Catalina, A. V., Universities Space Research Association, USA; Juretzko, F., Alabama Univ., USA; Dhindaw, B. K., Indian Inst. of Tech., India; Curreri, P. A., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; Conference on International Space Station Utilization, 6 Oct. 2001, Cocoa Beach, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The interaction of an insoluble particle with a growing solid-liquid interface (SLI) has been a subject of investigation for the four decades. For a metallurgist or a material scientist understanding the fundamental physics of such an interaction is relevant for applications that include distribution of reinforcement particles in metal matrix composites, inclusion management in castings, and distribution of Y_2BaCuO_5 (211) precipitates (flux pinning sites) in $YBa_2Cu_3O_7$ (123) superconducting crystals. The same physics is also applicable to other areas including geological applications (frost heaving in soils) and preservation of biological cells. Experimentally this interaction can be quantified in terms of a critical growth velocity, V_{cr} , of the SLI below which particles are pushed ahead of the advancing interface, and above which the particles are engulfed. Past experimental evidence suggests that this V_{cr} is an inverse function of the particle radius, R . In order to isolate the fundamental physics that governs such a relationship it is necessary to minimize natural convection at the SLI that is inherent in ground based experiments. Hence for the purpose of producing benchmark data (V_{cr} vs. R) PEP is a natural candidate for micro-gravity experimentation. Accordingly, experiments with pure Al containing a dispersion of ZrO_2 particles and an organic analogue, succinonitrile (SCN) containing polystyrene particles have been performed on the LMS and USMP-4 mission respectively. In this paper we will summarize the experimental data that was obtained during these two micro-gravity missions and show that the results differ compared to terrestrial experiments. We will also discuss the basic elements of our analytical and numerical model and present a comparison of the predictions of these models against micro-gravity experimental data. Finally, we will discuss our future experimental plan that includes the ISS glovebox and MSRR1.

Author

Spaceborne Experiments; Liquid-Solid Interfaces; Metal Matrix Composites; YBCO Superconductors; Zirconium Oxides; Gravitational Effects

20010078966 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Macroscopic Evolution of Particle Systems with Short and Long Range Interactions

Giacomin, Giambattista, Milan Univ., Italy; Lebowitz, Joel L., Rutgers Univ., USA; Marra, Rossana, Istituto Nazionale di Fisica Nucleare, Italy; Apr. 2000; 28p; In English

Report No.(s): PB2001-105849; IHES/P/00/34; No Copyright; Avail: CASI; A01, Microfiche; A03, Hardcopy

We consider a lattice gas with general short range interactions and a Kac potential $J(\gamma)(r)$ of range $(\gamma \supset -1)$ γ greater than 0, evolving via particles hopping to nearest neighbor empty sites with rates which satisfy detailed balance with respect to the equilibrium measure.

NTIS

Mathematical Models; Potential Theory; Equilibrium Equations

20010079654 NASA Goddard Space Flight Center, Greenbelt, MD USA

Calculation of the Scattering Amplitude Without Partial Wave Expansion

Shertzer, J., College of the Holy Cross, USA; Temkin, Aaron, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; XXII ICPEAC, 18-24 Jul. 2001, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

Two developments in the direct calculation of the angular differential scattering amplitude have been implemented: (a) The integral expansion of the scattering amplitude is simplified by analytically integration over the azimuthal angle. (b) The resulting integral as a function of scattering angle is calculated by using the numerically generated wave function from a finite element method calculation. Results for electron-hydrogen scattering in the static approximation will be shown to be as accurate as a partial wave expansion with as many l 's as is necessary for convergence at the incident energy being calculated.

Author

Scattering Amplitude; Wave Functions; Electron Scattering

20010079694 Rutherford Appleton Lab., Chilton UK

New Model for Electron Ranges in Solid Materials

Bateman, J. E.; Dec. 06, 2000; 70p

Report No.(s): PB2001-105855; RAL-TR-2000-051; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

A new definition is proposed for the range of fast (1keV-50keV) electrons in solid materials: the spherical range. Associated with a simple model it permits calculation of the transmission of electrons through foils and the escape efficiency of electron yield measurements in surface studies such as x-ray absorption fine structure. For materials of moderate to high atomic number (Z greater than 25) the spherical range takes better account of the effects of elastic scattering on the range than the usual extrapolated range parameter.

NTIS

X Ray Absorption; Electrons; Models; Solid Phases

20010079915 NASA Goddard Space Flight Center, Greenbelt, MD USA

Complex Correlation Calculation of e-H Total Cross Sections

Bhatia, A. K., NASA Goddard Space Flight Center, USA; Temkin, Aaron, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; XXII ICPEAC, 18-24 Jul. 2001, Unknown; No Copyright; Avail: Issuing Activity; Abstract Only

Calculation of e - H total and elastic partial wave cross sections is being carried out using the complex correlation variational T-matrix method. In this preliminary study, elastic partial wave phase shifts are calculated with the correlation functions which are confined to be real. In that case the method reduces to the conventional optical potential approach with projection operators.

Author

Matrices (Mathematics); Cross Sections; Wave Functions

20010082952 NASA Ames Research Center, Moffett Field, CA USA

Effective Potential Energies and Transport Cross Sections for Interactions of Hydrogen and Nitrogen

Stallcop, James R., NASA Ames Research Center, USA; Partridge, Harry, NASA Ames Research Center, USA; Levin, Eugene, NASA Ames Research Center, USA; [2000]; 1p; In English

Contract(s)/Grant(s): NAS2-99092; No Copyright; Avail: Issuing Activity; Abstract Only

The interaction energies for N₂-He and N₂-H₂ are calculated by accurate ab initio methods. The virial coefficient and differential scattering cross section for N₂-H₂ are calculated; the theoretical results are compared with experimental data. The transport collision integrals for N₂-H₂ and N₂-N₂ interactions are calculated and tabulated; the results yield transport coefficients that compare well with measured data. Transport coefficients are found to be determined accurately from the interaction energies for a specific configuration of the molecule formed from the interaction partners. Comparisons with results of measurement and accurate calculations demonstrate that the transport properties of complex molecular interactions can be determined rapidly and fairly accurately from the interaction energies of simpler system using combination rules for the short-range parameters of effective interaction energies and the coefficients for the long-range forces. The coefficients for a two-parameter temperature expansion of diffusion and viscosity are tabulated for a realistic universal potential energy that is based primarily on the results of very accurate calculations of the He-He interaction energy.

Author

Hydrogen; Nitrogen; Potential Energy; Transport Properties; Helium

73

NUCLEAR PHYSICS

Includes nuclear particles; and reactor theory. For space radiation see 93 Space Radiation. For atomic and molecular physics see 72 Atomic and Molecular Physics. For elementary particle physics see 77 Physics of Elementary Particles and Fields. For nuclear astrophysics see 90 Astrophysics.

20010081949 Iowa Univ., Dept. of Physics and Astronomy, Iowa City, IA USA

Kinetic Alfven Wave Electron Acceleration on Auroral Field Lines, 1 Sep. 1997 - 28 Feb. 2001

Kletzing, Craig A., Iowa Univ., USA; [2001]; 5p; In English

Contract(s)/Grant(s): NAG5-6525; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Major results of the S3-3 Langmuir sweep study are published. Studies show statistics and average density and temperature variation on auroral field lines up to 8000 km altitude. Alfven wave papers were published. Our model of Alfven wave propagation

on auroral field lines was successfully extended to handle varying density and magnetic field for the inertial mode. The study showed that Alfvén wave can create time-dispersed electron signatures. A study was undertaken to extend Langmuir sweep I-V curves to handle the case of an kappa electron distribution as well as Maxwellian. The manuscript is in preparation. Participated in International Space Science Institute study of Alfvénic structures which resulted in a group review paper. The proposed work was to develop an extended model of Alfvén wave propagation along auroral field lines to study electron acceleration. As part of this work, a major task was to characterize density and temperature along auroral field lines by using spacecraft Langmuir sweep data. The work that was completed under this funding was successful at both tasks. Three papers have been published as part of this work and a fourth manuscript is in preparation.

Author

Auroral Zones; Plasma Waves; Wave Propagation; Electron Density Profiles; Mathematical Models

74 OPTICS

Includes light phenomena and the theory of optical devices. For lasers see 36 Lasers and Masers.

20010078911 NASA Marshall Space Flight Center, Huntsville, AL USA

AMSD Alignment Sensitivity Analysis

Reardon, Patrick, Alabama Univ., USA; Stahl, Philip, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; MSFC Technology Days, 9-10 May 2001, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

A review of the optical layout for AMSD testing is presented. This includes all optical components from the point source to the mirror under test. The independent sources of error and uncertainty are discussed, and the approach to determining and reducing the measurement uncertainties is presented.

Author

Sensitivity Analysis; Alignment; Mirrors; Optical Equipment

20010078912 NASA Marshall Space Flight Center, Huntsville, AL USA

Recent Enhancements of the Phased Array Mirror Extendible Large Aperture (PAMELA) Telescope Testbed at MSFC

Rakoczy, John, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; MSFC Technology Days, 9-10 May 2001, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Recent incremental upgrades to the Phased Array Mirror Extendible Large Aperture (PAMELA) telescope testbed have enabled the demonstration of phasing (with a monochromatic source) of clusters of primary mirror segments down to the diffraction limit. PAMELA upgrades include an improved Shack-Hartmann wavefront sensor, passive viscoelastic damping treatments for the voice-coil actuators, mechanical improvement of mirror surface figures, and optical bench baffling. This report summarizes the recent PAMELA upgrades, discusses the lessons learned, and presents a status of this unique testbed for wavefront sensing and control. The Marshall Space Flight Center acquired the Phased Array Mirror Extendible Large Aperture (PAMELA) telescope in 1993 after Kaman Aerospace was unable to complete integration and testing under the limited SDIO and DARPA funding. The PAMELA is a 36-segment, half-meter aperture, adaptive telescope which utilizes a Shack-Hartmann wavefront sensor, inductive coil edge sensors, voice coil actuators, imaging CCD cameras and interferometry for figure alignment, wavefront sensing and control. MSFC originally obtained the PAMELA to supplement its research in the interactions of control systems with flexible structures. In August 1994, complete tip, tilt and piston control was successfully demonstrated using the Shack-Hartmann wavefront sensor and the inductive edge sensors.

Author

Phased Arrays; Apertures; Telescopes; Optical Equipment; Imaging Techniques; Actuators; Viscoelastic Damping

20010078963 NASA Marshall Space Flight Center, Huntsville, AL USA

AMSD Test Plan

Stahl, H. Philip, NASA Marshall Space Flight Center, USA; Hadaway, James, Alabama Univ., USA; [2001]; 1p; In English; MSFC Technology Days, 9-10 May 2001, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

NASA MSFC is the lead center on the Advanced Mirror System Demonstrator (AMSD) project and therefore has responsibility for testing each AMSD mirror to certify its compliance with the SOW. To accomplish this task it is necessary to accurately characterize each mirror's Radius of Curvature, Optical Axis Vertex Location, Conic Constant and Surface Figure

Error. A key challenge is how to measure these parameters in the presence of gravity sag. This presentation will outline the MSFC/UAH team's proposed AMSD test plan.

Author

Mirrors; Curvature; Errors; Conics; Gravitation

20010078970 NASA Marshall Space Flight Center, Huntsville, AL USA

Segment Alignment Maintenance System for the Hobby-Eberly Telescope

Rakoczy, John, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; MSFC Technology Days, 9-10 May 2001, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

NASA's Marshall Space Flight Center, in collaboration with Blue Line Engineering of Colorado Springs, Colorado, is developing a Segment Alignment Maintenance System (SAMS) for McDonald Observatory's Hobby-Eberly Telescope (HET). The SAMS shall sense motions of the 91 primary mirror segments and send corrections to HET's primary mirror controller as the mirror segments misalign due to thermo-elastic deformations of the mirror support structure. The SAMS consists of inductive edge sensors. All measurements are sent to the SAMS computer where mirror motion corrections are calculated. In October 2000, a prototype SAMS was installed on a seven-segment cluster of the HET. Subsequent testing has shown that the SAMS concept and architecture are a viable practical approach to maintaining HET's primary mirror figure, or the figure of any large segmented telescope. This paper gives a functional description of the SAMS sub-array components and presents test data to characterize the performance of the subarray SAMS.

Author

Alignment; Segmented Mirrors; Telescopes; Maintenance; Deformation

20010078971 NASA Marshall Space Flight Center, Huntsville, AL USA

XRCF Testing Capabilities

Reily, Cary, NASA Marshall Space Flight Center, USA; Kegely, Jeff, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; MSFC Technology Days, 9-10 May 2001, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Space Optics Manufacturing Technology Center's X-ray Calibration Facility has been recently modified to test Next Generation Space Telescope (NGST) developmental mirrors at cryogenic temperatures (35 degrees Kelvin) while maintaining capability for performance testing of x-ray optics and detectors. The facility's current cryo-optical testing capability and potential modifications for future support of NGST will be presented.

Author

X Ray Optics; Calibrating; Cryogenics; Performance Tests; Space Manufacturing; Mirrors

20010078972 NASA Marshall Space Flight Center, Huntsville, AL USA

IABG CSiC Mirror

Stahl, H. Philip, NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; MSFC Technology Days, 9-10 May 2001, Huntsville, AL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

CSiC has been proposed as a material for large cryogenic mirrors because of its unique material properties. However, there is limited experience in the cryogenic optical performance of CSiC mirrors. Therefore, a CSiC mirror was fabricated for NASA MSFC by IABG, polished by General Optics and cryogenic tested by MSFC in its XRCF. This presentation will review the history of this mirror and summarize the results of its cryogenic testing.

Author

Silicon; Cryogenics; Mirrors; Carbon

20010078973 NASA Marshall Space Flight Center, Huntsville, AL USA

Systematic Image Based Optical Alignment and Tensegrity

Zeiders, Glenn W., NASA Marshall Space Flight Center, USA; [2001]; 1p; In English; MSFC Technology Days, 9-10 May 2001, Huntsville, AL, USA

Contract(s)/Grant(s): NAS8-99089; NAS8-00007; No Copyright; Avail: Issuing Activity; Abstract Only

This presentation will review the objectives and current status of two Small Business Innovative Research being performed by the Sirius Group, under the direction of MSFC. They all relate to the development of advanced optical systems technologies for automated segmented mirror alignment techniques and fundamental design methodologies for ultralight structures. These are important to future astronomical missions in space.

Author

Segmented Mirrors; Structural Weight; Alignment; Design Analysis; Optical Properties

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

20010077908 Sandia National Labs., Plasma Sciences Dept., Albuquerque, NM USA

Dust in the Ion Wind: A Model for Plasma Dust Particle Dynamics

Riley, M. E.; Feb. 2001; 34p; In English

Report No.(s): DE2001-780294; SAND2001-0406; No Copyright; Avail: Department of Energy Information Bridge

We will show in this work that there is a possibility of unstable motion when the ion wind force on the particle is sufficiently strong. Since the ion wind force is predominately a decreasing function of the relative velocity of the ions and the particle, this can lead to unstable oscillatory motion. Potentially, this would appear to be an almost universal phenomenon for plasma dust particles.

NTIS

Ions; Dust; Plasma Dynamics; Particles; Dusty Plasmas; Plasma Physics

20010080474 NASA Ames Research Center, Moffett Field, CA USA

Simulation and Experimental Measurements of Inductively Coupled CF₄ and CF₄/Ar Plasmas

Hash, D. B., NASA Ames Research Center, USA; Bose, D., NASA Ames Research Center, USA; Rao, M. V. V. S., NASA Ames Research Center, USA; Cruden, B. A., NASA Ames Research Center, USA; Meyyappan, M., NASA Ames Research Center, USA; Sharma, S. P., NASA Ames Research Center, USA; [2000]; 1p; In English; 53rd Gaseous Electronics Conference, 24-27 Oct. 2000, Houston, TX, USA

Contract(s)/Grant(s): NAS2-99092; RTOP 632-10-01; No Copyright; Avail: Issuing Activity; Abstract Only

The recently developed code SEMS (semiconductor equipment modeling software) is applied to the simulation of CF₄ and CF₄/Ar inductively coupled plasmas (ICP). This work builds upon the earlier nitrogen, transformer coupled plasma (TCP) SEMS research by demonstrating its accuracy for more complex reactive mixtures, moving closer to the realization of a virtual plasma reactor. Attention is given to the etching of and/or formation of carbonaceous films on the quartz dielectric window and diagnostic apertures. The simulations are validated through comparisons with experimental measurements using FTIR (Fourier Transform Infrared) and UV absorption spectroscopy for CF_x and SiF_x neutral radicals, QMS (quadrupole mass spectrometry) for the ions, and Langmuir probe measurements of electron number density and temperature in an ICP GEC reference cell.

Author

Methane; Plasmas (Physics); Inductively Coupled Plasma Mass Spectrometry; Absorption Spectroscopy; Computerized Simulation

76 SOLID-STATE PHYSICS

Includes condensed matter physics, crystallography, and superconductivity. For related information see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

20010077896 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Kaehler-Ricci Solitons on Toric Fano Varieties

Zhu, X.; Aug. 2000; 27p; In English

Report No.(s): PB2001-105136; IHES/M/00/58; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper, the authors discuss the existence of Kahler-Ricci soliton by reducing to solve certain complex Monge-Ampere equation on a compact complex manifold with positive first Chern class, especially on a toric Fanno variety. As similar as the study of Kahler-Einstein metrics, one can use continuity method to solve such a complex Monge-Ampere equation. In fact, many places can be modified as in the proof of uniqueness ((bar)TZ2) although some new difficulties will arise. The purpose of this paper is to give an approach to solve these difficulties.

NTIS

Manifolds (Mathematics); Monge-Ampere Equation; Theorem Proving; Solitary Waves

20010079194 Rutherford Appleton Lab., Chilton UK

Resonant Magnetic X-ray Diffraction

Longridge, S.; Lovesey, S. W.; Oct. 11, 2000; 51p

Report No.(s): PB2001-105856; RAL-TR-2000-043; Copyright; Avail: National Technical Information Service (NTIS), Microfiche

Traditionally, the technique of choice for the study at an atomic level of detail of magnetic structures, correlations and excitations has been magnetic neutron scattering. Reviews of the neutron probe in the study of magnetism have been presented by Rossat-Mignod (1987) and Stirling and McEwen (1987). Two features of the neutron are pivotal in attaining this status: (1) the wavelength of a thermal neutron is a good match to the spacing of ions in a crystal and (2) the neutron carries a magnetic moment and it interacts strongly with electronic magnetic moments. However, the ready availability of sophisticated diffraction instruments supplied with an intense beam of photon, from a synchrotron source, beckons a reappraisal of the status quo.

NTIS

X Ray Diffraction; Magnetic Field Configurations; Magnetic Properties; Atoms

20010081321 NASA Ames Research Center, Moffett Field, CA USA

Carbon Nanotubes by CVD and Applications

Cassell, Alan, NASA Ames Research Center, USA; Delzeit, Lance, NASA Ames Research Center, USA; Nguyen, Cattien, NASA Ames Research Center, USA; Stevens, Ramsey, NASA Ames Research Center, USA; Han, Jie, NASA Ames Research Center, USA; Meyyappan, M., NASA Ames Research Center, USA; Jan. 03, 2001; 9p; In English; EUROCVF Conference, 26-31 Aug. 2001, Athens, Greece

Contract(s)/Grant(s): RTOP 632-62-01; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Carbon nanotube (CNT) exhibits extraordinary mechanical and unique electronic properties and offers significant potential for structural, sensor, and nanoelectronics applications. An overview of CNT, growth methods, properties and applications is provided. Single-wall, and multi-wall CNTs have been grown by chemical vapor deposition. Catalyst development and optimization has been accomplished using combinatorial optimization methods. CNT has also been grown from the tips of silicon cantilevers for use in atomic force microscopy.

Author

Vapor Deposition; Atomic Force Microscopy; Nanotubes; Carbon; Combinatorial Analysis

20010082514 NASA Ames Research Center, Moffett Field, CA USA

Curvature Dependent Reactivity of Fullerenes and Nanotubes

Park, Seongjun, Stanford Univ., USA; Cho, Kyeongjae, Stanford Univ., USA; Srivastava, Deepak, NASA Ames Research Center, USA; [2000]; 8p; In English; 8th Foresight Conference on Molecular Nanotechnology, 2-5 Nov. 2000, Bethesda, MD, USA

Contract(s)/Grant(s): DTTS59-99-D-00437; NASA Order A-61812-D; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Dependence of pyramidalization angle, examples of nanotube surfaces, internal and external reactivity, and binding energies are some of the topics discussed in this conference presentation preprint. Final conclusions include the relationship between the pyramidal angle of the surface and its associated external reaction energy.

CASI

Fullerenes; Nanotubes; Surface Properties; Curvature; Reactivity

20010082946 NASA Ames Research Center, Moffett Field, CA USA

Modeling of HiPco Process for Carbon Nanotube Production

Gokcen, T., NASA Ames Research Center, USA; Dateo, C. E., NASA Ames Research Center, USA; Meyyappan, M., NASA Ames Research Center, USA; Colbert, D. T., NASA Ames Research Center, USA; Smith, D. T., NASA Ames Research Center, USA; Smith, K., NASA Ames Research Center, USA; Smalley, R. E., NASA Ames Research Center, USA; [2000]; 1p; In English; American Vacuum Society Meeting, 2-6 Oct. 2000, Boston, MA, USA; Sponsored by American Vacuum Society, USA

Contract(s)/Grant(s): RTOP 632-10-01; No Copyright; Avail: Issuing Activity; Abstract Only

High-pressure carbon monoxide (HiPco) reactor, developed at Rice University, is used to produce single-walled carbon nanotubes (SWNT) from gas-phase reactions of iron carbonyl and nickel carbonyl in carbon monoxide at high pressures (10 - 100 atm). Computational modeling is used to better understand the HiPco process. In the present model, decomposition of the precursor, metal cluster formation and growth, and carbon nanotube growth are addressed. Decomposition of precursor molecules is necessary to initiate metal cluster formation. The metal clusters serve as catalysts for carbon nanotube growth. Diameter of metal clusters and number of atoms in these clusters are some of the essential information for predicting carbon nanotube formation and

growth, which is then modeled by Boudouard reaction ($2\text{CO} \rightarrow \text{C(s)} + \text{CO}_2$) with metal catalysts. The growth kinetic model is integrated with a two-dimensional axisymmetric reactor flow model to predict reactor performance.

Author

High Pressure; Nanotubes; Reaction Kinetics; Carbon Monoxide; Mathematical Models

20010082949 Rice Univ., Houston, TX USA

Comparison of Conjugate Gradient Density Matrix Search and Chebyshev Expansion Methods for Avoiding Diagonalization in Large-Scale Electronic Structure Calculations

Bates, Kevin R., Rice Univ., USA; Daniels, Andrew D., Rice Univ., USA; Scuseria, Gustavo E., Rice Univ., USA; Journal of Chemical Physics; Sep. 01, 1998; Volume 109, No. 9, pp. 3308-3312; In English

Contract(s)/Grant(s): NAG2-1112; Copyright; Avail: Issuing Activity

We report a comparison of two linear-scaling methods which avoid the diagonalization bottleneck of traditional electronic structure algorithms. The Chebyshev expansion method (CEM) is implemented for carbon tight-binding calculations of large systems and its memory and timing requirements compared to those of our previously implemented conjugate gradient density matrix search (CG-DMS). Benchmark calculations are carried out on icosahedral fullerenes from C₆₀ to C₈₆₄₀ and the linear scaling memory and CPU requirements of the CEM demonstrated. We show that the CPU requisites of the CEM and CG-DMS are similar for calculations with comparable accuracy.

Author

Chebyshev Approximation; Conjugate Gradient Method; Electronic Structure; Algorithms

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PHYSICS OF ELEMENTARY PARTICLES AND FIELDS

Includes quantum mechanics; theoretical physics; and statistical mechanics. For related information see also 72 Atomic and Molecular Physics, 73 Nuclear Physics, and 25 Inorganic, Organic and Physical Chemistry.

20010080459 Rice Univ., Dept. of Chemistry, Houston, TX USA

C2 Fragmentation Energy of C60 Revisited: Theory Disagrees with Most Experiments

Boese, A. Daniel, Rice Univ., USA; Scuseria, Gustavo E., Rice Univ., USA; Chemical Physics Letters; Sep. 11, 1998; ISSN 0009-2614; Volume 294, pp. 233-236; In English

Contract(s)/Grant(s): NAG2-1112; NSF CHE-96-18323; Copyright; Avail: Issuing Activity

Following our earlier work on the subject, we have carried out density functional theory (DFT) and second-order Moller-Plesset perturbation theory (MP2) calculations of the dissociation energy of the reaction C₆₀ yields C₅₈ + C₂ using polarized basis sets and geometries optimized with DFT methods. The present theoretical results support an electronic fragmentation energy D(sub e) around 10-11 eV in disagreement with most experimental results that place the dissociation energy D(sub o) (including zero point energy) around 7-8 eV. The plausible errors remaining in the theoretical calculations are unlikely to account for this big difference (2-4 eV).

Author

Heat of Dissociation; Perturbation Theory; Chemical Reactions; Fragmentation

20010081934 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Characterizing Volume Forms

Cartier, P.; Berg, M.; Dewitt-Morette, C.; Wurm, A.; Apr. 2001; 26p; In English; Portions of this document are not fully legible Report No.(s): PB2001-106895; IHES/P/01/17; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Old and new results for characterizing volume forms in functional integration.

NTIS

Functional Integration; Volume; Characterization

ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

20010077856 Department of Transportation, Office of the Inspector General, Washington, DC USA

US Department of Transportation Office of Inspector General *Semiannual Report, 1 Oct. 1996 - 31 Mar. 1997*

1997; 76p; In English; Original contains color illustrations

Report No.(s): PB2001-107517; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report, required by the Inspector General (IG) Act of 1978, as amended, summarizes the activities and accomplishments of the Department of Transportation's (DOT) Office of Inspector General (OIG) during the period October 1, 1996, to March 31, 1997. The report has been prepared in accordance with Public Law (P.L.) 100-504, IG Act Amendments of 1988, which changed reporting definitions for OIG and requires the reporting of management decisions on OIG audit recommendations. Because the role of OIG is to identify problems and weaknesses and prevent fraud, waste, and abuse, our emphasis has been placed in the areas most susceptible or vulnerable to these problems. The reader should not assume from this report that the significance of findings and recommendations described are representative of the overall condition of DOT's programs and operations.

NTIS

Public Law; Reports; Transportation

20010077857 State Dept., Office of Inspector General, Washington, DC USA

Year 2000 Lessons Learned: Strategies for Successful Global Project Management

May 2001; 86p; In English

Report No.(s): PB2001-107551; REPT-01-IT-008; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report outlines the results of our study of leading practices, ancillary benefits, and lessons learned-both positive and negative-from the Y2K crisis management exercise. Our work is built on interviews and data gathering in the Washington, DC, metropolitan area, at financial institutions and the United Nations (UN) in New York City, at one U.S. military base, and in eight locations around the globe. Rather than an audit, the report brings together the perspectives and analysis of many key players and observers in the Y2K management exercise. This information is intended to provide guidance that managers might consider and apply in undertaking global projects to address IT or other emerging global issues in the new millennium.

NTIS

Project Management; Information Systems; Management Methods

20010078205 Central Lab. of the Research Councils, Daresbury Lab., Warrington, UK

Report of the Council for the Central Laboratory of the Research Councils *Annual Report, 1 Apr. 1999 - 31 Mar. 2000*

Jul. 20, 2000; 40p; In English; Original contains color illustrations

Report No.(s): PB2001-106266; Copyright; Avail: National Technical Information Service (NTIS)

The objectives for which the Council is established and incorporated are: (1) to promote high quality scientific and engineering research by providing facilities and technical expertise in support of basic, strategic and applied research programs funded by persons established in this Our UK and elsewhere; (2) to support the advancement of knowledge and technology, meeting the needs of research councils, other customers and their user communities, thereby contributing to the economic competitiveness of Our UK and the quality of life; (3) to provide advice, disseminate knowledge, and promote public understanding in the fields of science, engineering and technology as engaged in by the Council under (1) and (2) above.

NTIS

Synchrotron Radiation; Research and Development; Laboratories

20010078248 Department of Transportation, Office of Inspector General, Washington, DC USA

US Department of Transportation Office of Inspector General *Semiannual Report, 1 Apr. - 3 Sep. 1998*

1998; 60p; In English

Report No.(s): PB2001-107521; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report, required by the Inspector General (IG) Act of 1978, as amended, summarizes the activities and accomplishments of the Department of Transportation's (DOT) Office of Inspector General (OIG) during the period April 1, 1998, to September 30, 1998. The report has been prepared in accordance with Public Law (P.L.) 100-504, IG Act Amendments of 1988, which changed reporting definitions for OIG and requires the reporting of management decisions on OIG audit recommendations. Because the role of OIG is to identify problems and weaknesses and prevent fraud, waste, and abuse, our emphasis has been placed

in the areas most susceptible or vulnerable to these problems. The reader should not assume from this report that the significance of findings and recommendations described are representative of the overall condition of DOT's programs and operations.

NTIS

Public Law; Transportation; Regulations

20010078251 Department of Transportation, Office of the Inspector General, Washington, DC USA

Department of Transportation Office of Inspector General Semiannual Report, 1 Apr. 30 - Sep. 1999

1999; 60p; In English

Report No.(s): PB2001-107522; No Copyright; Avail: National Technical Information Service (NTIS)

This report, required by the Inspector General (IG) Act of 1978, as amended, summarizes the activities and accomplishments of the Department of Transportation's (DOT) Office of Inspector General (OIG) during the period April 1, 1999, to September 30, 1999. The report has been prepared in accordance with Public Law (P.L.) 100-504, IG Act Amendments of 1988, which changed reporting definitions for OIG and requires the reporting of management decisions on OIG audit recommendations. Because the role of OIG is to identify problems and weaknesses and prevent fraud, waste, and abuse, our emphasis has been placed in the areas most susceptible or vulnerable to these problems. The reader should not assume from this report that the significance of findings and recommendations described are representative of the overall condition of DOT's programs and operations.

NTIS

Reports; Transportation; Public Law

20010078252 Department of Transportation, Office of Inspector General, Washington, DC USA

US Department of Transportation Office of Inspector General Semiannual Report, 1 Apr. - 30 Sep. 1997

2001; 76p; In English; Original contains color illustrations

Report No.(s): PB2001-107520; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report, required by the Inspector General (IG) Act of 1978, as amended, summarizes the activities and accomplishments of the Department of Transportation's (DOT) Office of Inspector General (OIG) during the period April 1, 1997, to September 30, 1997. The report has been prepared in accordance with Public Law (P.L.) 100-504, IG Act Amendments of 1988, which changed reporting definitions for OIG and requires the reporting of management decisions on OIG audit recommendations. Because the role of OIG is to identify problems and weaknesses and prevent fraud, waste, and abuse, our emphasis has been placed in the areas most susceptible or vulnerable to these problems. The reader should not assume from this report that the significance of findings and recommendations described are representative of the overall condition of DOT's programs and operations.

NTIS

Public Law; Transportation; Reports

20010078253 Department of Transportation, Office of the Inspector General, Washington, DC USA

US Department of Transportation Office of Inspector General Semiannual Report, 1 Apr. - 30 Sep. 1996

Oct. 07, 1996; 96p; In English; Original contains color illustrations

Report No.(s): PB2001-107519; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report, required by the Inspector General (IG) Act of 1978, as amended, summarizes the activities and accomplishments of the Department of Transportation's (DOT) Office of Inspector General (OIG) during the period April 1, 1996, to September 30, 1996. The report has been prepared in accordance with Public Law (P.L.) 100-504, IG Act Amendments of 1988, which changed reporting definitions for OIG and requires the reporting of management decisions on OIG audit recommendations. Because the role of OIG is to identify problems and weaknesses and prevent fraud, waste, and abuse, our emphasis has been placed in the areas most susceptible or vulnerable to these problems. The reader should not assume from this report that the significance of findings and recommendations described are representative of the overall condition of DOT's programs and operations.

NTIS

Public Law; Transportation; Reports

20010078254 Department of Transportation, Office of the Inspector General, Washington, DC USA

US Department of Transportation Office of Inspector General Semiannual Report, 1 Oct. 1998 - 31 Mar. 1999

1999; 64p; In English

Report No.(s): PB2001-107518; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report, required by the Inspector General (IG) Act of 1978, as amended, summarizes the activities and accomplishments of the Department of Transportation's (DOT) Office of Inspector General (OIG) during the period October 1, 1998, to March 31, 1999. The report has been prepared in accordance with Public Law (P.L.) 100-504, IG Act Amendments of 1988, which changed

reporting definitions for OIG and requires the reporting of management decisions on OIG audit recommendations. Because the role of OIG is to identify problems and weaknesses and prevent fraud, waste, and abuse, our emphasis has been placed in the areas most susceptible or vulnerable to these problems. The reader should not assume from this report that the significance of findings and recommendations described are representative of the overall condition of DOT's programs and operations.

NTIS

Public Law; Transportation; Reports

20010078967 Office of Management and Budget, Washington, DC USA

Seminar on Integrating Federal Statistical Information and Processes: Statistical Policy Working Paper No. 32, Parts 1 and 2

Apr. 2001; 402p; In English

Report No.(s): PB2001-104626; STATISTICAL POLICY WP-32; No Copyright; Avail: CASI; A04, Microfiche; A18, Hardcopy

On November 8-9, 2000, the Council of Professional Associations on Federal Statistics (COPAFS) hosted a 'Seminar on Integrating Federal Statistical Information and Processes.' Developed to capitalize on work undertaken during the past twenty years by the Federal Committee on Statistical Methodology and its subcommittees, the seminar focused on a variety of topics that have been explored thus far in the Statistical Policy Working Paper series and on work on statistical standards done by the Statistical Policy Office. The subjects covered at the seminar included: Integrating Approaches to Performance Measurement Planning and Reporting; Integrating Policies and Practices for Data Confidentiality; Integrating Survey Concepts and Designs; Integrating Comparable Measures of Disability in Federal Surveys; Language Differences and Linguistic Isolation: Measurement Issues and Implications for Surveys; Integrating Electronic Systems for Disseminating Statistics; Understanding and Integrating Economic Data from Disparate Sources; Integrating Geographical Information with Statistical Programs: Challenges and Opportunities; Best Practices for Understanding Non-Response in Surveys; Evaluating Approaches to Incentives for Survey Respondents; Best Practices in Contracting for Statistical Surveys; and Software Issues for Disseminating Statistical Information on CD-ROM.

NTIS

Surveys; Procedures; Policies; Information Dissemination; Planning

82

DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

20010078204 Georgia Inst. of Tech., Atlanta, GA USA

Handbook for Economic Development Geographic Information Systems

Drummond, W. J.; Nelson, A. C.; Sep. 1998; 164p; In English

Contract(s)/Grant(s): 99-07-13773

Report No.(s): PB2001-106395; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The purpose of geographic information system (GIS) technology is to answer 'where' questions through the manipulation of data by location. In the private sector, most business expansion decisions involve 'where' questions, such as identifying new plant or office locations, locating current and potential customers, and determining the best methods for product distribution. In the public sector, many important economic development policy issues have a 'where' dimension, including locational incentives for business attraction and job creation and environmental constraints to growth. It is clear that GIS technology could play an enhanced role in economic development. There are various reasons for this situation, but one of the most important is the lack of a shared language between economic development professionals and GIS specialists. Economic developers do not fully know what GIS can accomplish and GIS professionals do not adequately know what economic developers want to achieve. The goal of this handbook is to address these problems and encourage a higher level of economic development geographic information system (EDGIS) use at the local, state, and national levels.

NTIS

Geographic Information Systems; Economic Development; Handbooks

20010078920 NASA Goddard Space Flight Center, Greenbelt, MD USA

Assimilation of Cloud- and Land-Affected TOVS/ATOVS Level 1B Radiances in DAO's Next Generation Finite-Volume Data Assimilation System

Joiner, J., NASA Goddard Space Flight Center, USA; daSilva, A., NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; 9th Conference on Mesoscale Processes, 30 Jul. - 2 Aug. 2001, Fort Lauderdale, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

The Physical-space/Finite-volume Data Assimilation System (fvDAS) is the next generation global atmospheric data assimilation system in development at the Data Assimilation Office (DAO) at NASA's Goddard Space Flight Center. It is based on a new finite-volume general circulation model jointly developed by NASA and NCAR, and on the Physical-Space Statistical Analysis System (PSAS) developed at the DAO. In this talk we will focus on the assimilation of data from the (Advanced) TIROS Operational Vertical Sounder (ATOVS), with emphasis on the impact of cloud- and land-affected level 1B radiances. Recently, it has been shown that the use of observations from satellite-borne microwave and infrared radiometers in data assimilation systems consistently increases forecast skill. Considerable effort has been expended over the past two decades, particularly with the (Advanced) TIROS Operational Vertical Sounder (ATOVS), to achieve this result. The positive impact on forecast skill has resulted from improvements in quality control algorithms, systematic error correction schemes, and more sophisticated data assimilation algorithms. Despite these advances, there are still many issues regarding the use of satellite data in data assimilation systems that remain unresolved. In particular, most operational centers still do not assimilate cloud- and land-affected TOVS data. In this study, we evaluate the impact of assimilating cloud-and land-affected TOVS/ATOVS level 1B data in DAO's next generation fvDAS, using a 1D variational scheme. We will discuss the impact of these data on both tropospheric and stratospheric forecasts, as well as on the general aspects of the earth climate system.

Author

Clouds (Meteorology); Land; Radiance; Tiros N Series Satellites; Atmospheric General Circulation Models; Finite Volume Method

20010078923 Army Construction Engineering Research Lab., Champaign, IL USA

Geospatial Data Enterprise Repository: A Report on the Prototype for Fort Hood, Texas Final Report

Ruiz, Marilyn; Morrison, Dawn; Bouwman, David; McNinch, Kevin; Schreiner, Frank; Forbes, Shari; May 2001; 83p; In English Report No.(s): AD-A390487; ERDC/CERL-TR-01-46; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Geographic Information System (GIS) data management options have expanded rapidly over the past several years. Software and hardware advances have provided better network access to spatial data, allowed more complex geospatial data models, and have made the integration of GIS and database management systems a reality. At Fort Hood, Texas, GIS technology has been used extensively for military land management. Though their current technology is mature, there remain several issues related to geospatial data management that hinder efficiency, including: duplication of data themes, uncertainty about accountability for the content of key data themes, turn over of GIS staff with a subsequent loss of institutional knowledge, and time-consuming data requests. This report outlines a proposed plan for a centralized geospatial data repository, the Data Enterprise Repository (DER), to meet geospatial data requirements. The core users of the system are the Environmental Division Office, Cultural Resource Management Team, Natural Resource Branch, and the Integrated Training Area Management office. The DER will also benefit those who need to view maps from the system but do not use a GIS, and will enable people offsite, who are performing work at the installation, to get better access to the data they require for their work.

DTIC

Data Base Management Systems; Resources Management; Geographic Information Systems; Data Management

20010078964 NASA Goddard Space Flight Center, Greenbelt, MD USA

A Finite-Volume "Shaving" Method for Interfacing NASA/DAO's Physical Space Statistical Analysis System to the Finite-Volume GCM with a Lagrangian Control-Volume Vertical Coordinate

Lin, Shian-Jiann, NASA Goddard Space Flight Center, USA; DaSilva, Arlindo, NASA Goddard Space Flight Center, USA; [2001]; 1p; In English; AMS NWP Conference, 30 Jul. - 2 Aug. 2001, Fort Lauderdale, FL, USA; No Copyright; Avail: Issuing Activity; Abstract Only

Toward the development of a finite-volume Data Assimilation System (fvDAS), a consistent finite-volume methodology is developed for interfacing the NASA/DAO's Physical Space Statistical Analysis System (PSAS) to the joint NASA/NCAR finite volume CCM3 (fvCCM3). to take advantage of the Lagrangian control-volume vertical coordinate of the fvCCM3, a novel "shaving" method is applied to the lowest few model layers to reflect the surface pressure changes as implied by the final analysis. Analysis increments (from PSAS) to the upper air variables are then consistently put onto the Lagrangian layers as adjustments

to the volume-mean quantities during the analysis cycle. This approach is demonstrated to be superior to the conventional method of using independently computed "tendency terms" for surface pressure and upper air prognostic variables.

Author

Finite Volume Method; Statistical Analysis; Atmospheric General Circulation Models; Lagrangian Function

20010082354 i2 Technologies, Inc., Yorba Linda, CA USA

Leveraging New Information Technologies to Manage Obsolescence

Baca, Malcolm, i2 Technologies, Inc., USA; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 31-1 - 31-17; In English; See also 20010082326; Original contains color illustrations; Copyright Waived; Available from CASI only as part of the entire parent document

In the new economy of digital technology the transition rate of component level functionality is transitioning at an accelerated rate introducing greater functional complexity. As voltage output scales downward and micron line width design rules are reduced there are new generations of digital technology that offer superior functionality that is more reliable, uses less power, less real state, less weight, and smaller power supplies. The newer generations of component technology are rapidly causing the older generations of component technology to become obsolete because the cost of various functionality commodity groups are reduced with the scaled down designs. At i2 through our global semiconductor library maintenance we are recording 37,000 component discontinuance notifications on an annual basis. Within the digital category a new generation of microprocessors is being introduced every 18 months and a new generation of memory type devices is being introduced every nine months with speed and density increases. This high rate of technology transition is impacting the production and spares support to sustain weapon systems that require ten, twenty, thirty or more years of operational support.

Derived from text

Technology Utilization; Computer Components

20010082355 Zrinyi Miklos National Defence Univ., Budapest, Hungary

A Quasi-Copysafe Security of Documents on Normal Papersheets

Mezey, Gyula, Zrinyi Miklos National Defence Univ., Hungary; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 32-1 - 32-7; In English; See also 20010082326; Copyright Waived; Avail: CASI; A02, Hardcopy

A combination of 2D barcode with digital signature and normal text with polygonal watermark is proposed. Against synchronization attacks the watermark reference points are also included in the 2D barcode and secured by a digital signature, whilst the 2D barcode block(s) are embedded in the text.

Author

Security; Signatures

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ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

20010082352 Air Force Research Lab., Aeronautical Systems Sector, Wright-Patterson AFB, OH USA

An Integrated Approach to Reduced Total Ownership Costs of Aircraft (RTOC)

Selegan, David R., Air Force Research Lab., USA; Moorhouse, David J., Air Force Research Lab., USA; LaManna, William J., Boeing Co., USA; Strategies to Mitigate Obsolescence in Defense Systems Using Commercial Components; June 2001, pp. 29-1 - 29-11; In English; See also 20010082326; Copyright Waived; Avail: CASI; A03, Hardcopy

The Reduced Total Cost of Ownership (RTOC) Study was a unique, 'out-of-the-box', integrated Science and Technology (New Processes and Techniques) approach to obtaining more affordable aircraft weapon systems and modernizing these systems for future combat scenarios. The RTOC Study stands in contrast to the individual 'bits and pieces' technology transition plans seen in the past. Individual plans can result in costly programs that are hard to justify and are easily attacked when evaluating fiscal parameters. An integrated Reduced Total Ownership Cost (RTOC) approach, with substantiation data provided by the proposed follow-on effort, would be easily justified by these same fiscal parameters using this new cost database.

Author

Cost Reduction; Data Bases

TECHNOLOGY UTILIZATION AND SURFACE TRANSPORTATION

Includes aerospace technology transfer; urban technology; surface and mass transportation. For related information see 03 Air Transportation and Safety, 16 Space Transportation and Safety, and 44 Energy Production and Conversion. For specific technology transfer applications see also the category where the subject is treated.

20010079991 New York Academy of Sciences, New York, NY USA

Science, Technology, and the Economic Future

Raymond, Susan U., Editor, New York Academy of Sciences, USA; 19990101; 240p; In English; Sponsored by Science Policy Association, USA; ISBN 1-57331-147-2; Copyright; Avail: Issuing Activity

"There is no such thing as a fixed policy," noted the eminent British diplomat Lord Salisbury, "because policy like all organic entities is always in the making." Science and innovation represent flows of knowledge. Their impact and implications are, therefore, often difficult to relate effectively to a stock of public policy. Knowledge changes constantly; policy changes only with great deliberation and much effort. Yet it is essential that public policy formulation ensure that the best scientific thinking and technological innovation is reflected in policy, and that policy for science and technology encourages dynamic flows of knowledge. This is an often difficult and controversial proposition. Policy formulation is both a careful and a political process. In turn, science and technology cannot escape things political when it seeks to affect policy nor when it seeks to be supported by policy. As the following cases illustrate, formulating effective and timely policies that have science and technology implications is a complex undertaking.

Author

Policies; Technologies; Economics; Research and Development

20010081936 University Transportation Center for Alabama, Tuscaloosa, AL USA

Transfer of Transportation Management and Safety Technologies. UTCA Theme: Management and Safety of Transportation Systems

Delatte, N.; Eckhoff, D.; Toutanji, H.; McFadden, J.; Jan. 2001; 44p; In English

Contract(s)/Grant(s): DTRS98-G-0028

Report No.(s): PB2001-106931; UTCA-00202; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Four continuing education courses for transportation professionals were developed. Each course was one day long and was initially offered at the University of Alabama at Birmingham through its School of Engineering's Engineering Professional Development (EPD) program. The courses were geared toward engineers and managers and emphasized design, performance, specifications, quality control, and economic considerations. Course development and recruiting focused on state department of transportation personnel, city and county engineers, designers, construction company personnel, estimators, testing company personnel, researchers, and students. Courses offered were 'Concrete Technology for Transportation Professionals,' 'Uses of Aggregates in Transportation,' 'Concrete Pavement Restoration,' and 'Intelligent Transportation Systems,' Total course enrollment was approximately 63 students. The 2000 University Transportation Center for Alabama (UTCA) Technology Transfer Program is provided in this report as an appendix. Lessons learned from the development and delivery of the 2000 program are discussed. A UTCA technology transfer strategic plan and course catalog were developed. The course catalog is provided in this report as an appendix.

NTIS

Technology Transfer; Transportation; Safety; Education

ASTRONOMY

Includes observations of celestial bodies, astronomical instruments and techniques; radio, gamma-ray, x-ray, ultraviolet, and infrared astronomy; and astrometry.

20010079656 NASA Goddard Space Flight Center, Greenbelt, MD USA

The Stellar Imager (SI) Mission Concept

Carpenter, Kenneth G., NASA Goddard Space Flight Center, USA; Neff, Susan G., NASA Goddard Space Flight Center, USA; Armstrong, J. Thomas, Naval Research Lab., USA; Pauls, Thomas A., Naval Research Lab., USA; Schrijver, Carolus J., Stanford-Lockhead Inst. for Space Research, USA; [2001]; 1p; In English; 36th Liege International Astrophysical Colloquium, Liege, Belgium; No Copyright; Avail: Issuing Activity; Abstract Only

The Stellar Imager (SI) is envisioned as a space-based, UV-optical interferometer composed of 10 or more one-meter class elements distributed with a maximum baseline of 0.5 km. It will image stars and binaries with one hundred to one thousand

resolution elements on their surface and enable long-term studies of stellar magnetic activity patterns and their evolution with time, for comparison with those on the sun. It will also sound their interiors through asteroseismology to image internal structure, differential rotation, and large-scale circulations. SI will enable us to understand the various effects of magnetic fields of stars, the dynamos that generate them, and the internal structure and dynamics of the stars in which they exist. The ultimate goal is to achieve the best-possible forecasting of solar activity on times scales ranging up to decades, and an understanding of the impact of stellar magnetic activity on astrobiology and life in the Universe. The road to that goal will revolutionize our understanding of stars and stellar systems, the building blocks of the Universe. Fitting naturally within the NASA and ESA long-term time lines, SI complements defined missions, and with them will show us entire other solar systems, from the central star to their orbiting planets. In this paper we will describe the scientific goals of the mission, the performance requirements needed to address those goals, and the design concepts now under study.

Author

Stellar Systems; Asteroseismology; Optical Measuring Instruments; Stellar Activity; Spaceborne Astronomy; Space Missions

20010081939 NASA Goddard Space Flight Center, Greenbelt, MD USA

Arrays of Bolometric Detectors for Submillimeter Astronomy

Silverberg, R. F., NASA Goddard Space Flight Center, USA; Moseley, S. H., NASA Goddard Space Flight Center, USA; Freund, M., NASA Goddard Space Flight Center, USA; Allen, C., NASA Goddard Space Flight Center, USA; Harper, A., Yerkes Observatory, USA; Loewenstein, R., Yerkes Observatory, USA; Dowell, C. D., California Inst. of Tech., USA; [2001]; 1p; In English; Experimental Cosmology at mm-Waves, 13-19 Jul. 2001, Breuil-Cervinia, Italy; No Copyright; Avail: Issuing Activity; Abstract Only

Large format two dimensional arrays of bolometric detectors are required for many millimeter and submillimeter applications. We describe the development and testing of such arrays and the plans for using them in both a ground-based and airborne instrument.

Author

Astronomy; Submillimeter Waves; Bolometers

20010082931 NASA Ames Research Center, Moffett Field, CA USA

The Visibility of Earth Transits

Castellano, Tim, NASA Ames Research Center, USA; [2000]; 1p; In English; International Astronomical Union Meeting, 4-21 Aug. 2000, Manchester, UK; Sponsored by International Astronomical Union, Unknown

Contract(s)/Grant(s): RTOP 274-52-00-28; No Copyright; Avail: Issuing Activity; Abstract Only

The recent detection of planetary transits of the solar-like star HD 209458 at a distance of 47 parsecs suggest that transits can reveal the presence of Jupiter-size planetary companions in the solar neighborhood. Recent space-based transit searches have achieved photometric precision within an order of magnitude of that required to detect the much smaller transit signal of an earth-size planet around a solar-size star. Laboratory experiments in the presence of realistic noise sources have shown that CCDs can achieve photometric precision adequate to detect the 9.6×10^{-5} dimming, of the Sun due to a transit of the Earth. Space-based solar irradiance monitoring has shown that the intrinsic variability of the Sun would not preclude such a detection. Transits of the Sun by the Earth would be detectable by observers that reside within a narrow band of sky positions near the ecliptic plane, if the observers possess current Earth epoch levels of technology and astronomical expertise. A catalog of candidate target stars, their properties, and simulations of the photometric Earth transit signal detectability at each target is presented.

Author

Earth (Planet); Astronomy; Visual Photometry; Light (Visible Radiation); Catalogs (Publications)

90

ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust.

20010078050 Illinois Univ., USA

Energetics of Supernova Remnants *Final Report, 1 Feb. 1998 - 31 Jul. 2000*

Chu, You-Hua, Illinois Univ., USA; Williams, Rosa, Illinois Univ., USA; Dickel, John R., Illinois Univ., USA; Smith, Chris, Cerro Tololo Inter-American Observatory, Chile; Mar. 01, 2001; 2p; In English

Contract(s)/Grant(s): NAG5-7003; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We proposed to carry out a multi-wavelength analysis of SNR energetics for a large number of Large Magellanic Cloud (LMC) SNRs in different stages of evolution and with different ambient interstellar environments. This analysis will provide

insight as to how the energy of a SNR is partitioned in different forms, such as thermal, kinetic, and magnetic energies. The variety of SNR environments will allow us to evaluate the effects of local ISM conditions in the energy distributions in the SNRs, and how some of the energy is transferred to the surrounding ISM. The main dataset used in this study is from the ROSAT archive, and the secondary dataset is from the ASCA archive.

Derived from text

Supernova Remnants; Wavelengths

20010078201 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

Gravitational Wave Bursts from Cusps and Kinks on Cosmic Strings

Damour, T.; Vilenkin, A.; Apr. 2001; 30p; In English

Report No.(s): PB2001-106893; IHES/P-01/15; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The strong beams of high-frequency gravitational waves (GW) emitted by cusps and kinks of cosmic strings are studied in detail. As a consequence of these beams, the stochastic ensemble of GW's generated by a cosmological network of oscillating loops is strongly non Gaussian, and includes occasional sharp bursts that stand above the 'confusion' GW noise made of many smaller overlapping bursts. Even in only 10% of all string loops have cusps these bursts might be detectable by the planned GW detectors LIGO/VIRGO and LISA for string tensions as small as $G(\mu)$ approximately $10(\text{sup} -13)$. In the implausible case where the average cusp number per loop oscillation is extremely small, the smaller bursts emitted by the ubiquitous kinks will be detectable by LISA for string tensions as small as $G(\mu)$ approximately $10(\text{sup} -12)$. The authors show that the strongly non Gaussian nature of the stochastic GW's generated by strings modifies the usual derivation of constraints on $G(\mu)$ from pulsar timing experiments. In particular the usually considered 'rms GW background' is, when $G(\mu)$ approximately or is greater than $10(\text{sup} -7)$, an overestimate of the more relevant confusion GW noise because it includes rare, intense bursts.

NTIS

Cosmology; Gravitational Waves; Bursts; String Theory; Gravitation Theory

20010078214 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette France

No Consistent Cross-Interactions for a Collection of Massless Spin-2 Fields

Boulanger, N.; Damour, T.; Gualtieri, L.; Henneaux, M.; Sep. 2000; 18p; In English

Report No.(s): PB2001-105137; IHES/P/00/62; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The authors report a no-go theorem excluding consistent cross-couplings for a collection of massless, spin-2 fields described, in the free limit, by the sum of Pauli-Fierz actions (one for each field). The authors show that, in spacetime dimensions greater than 2, there is no consistent coupling, with at most two derivatives of the fields, that can mix the various 'gravitons'. The only possible deformations are given by the sum of individual Einstein-Hilbert actions (one for each field) with cosmological terms. The authors' approach is based on the BRST-based deformation point of view.

NTIS

Space-Time Functions; Cross Coupling; Gravitons; Homology

20010079034 Georgia Univ., Dept. of Physics and Astronomy, Athens, GA USA

Multiwavelength Modeling of Nove Atmospheres Final Report, 1 Oct. 1996 - 30 Apr. 2001

Huscholdt, P. H., Georgia Univ., USA; [2001]; 12p; In English

Contract(s)/Grant(s): NAG5-3619; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

LMC 1988 #1 was a slow, CO type, dust forming classical nova. It was the first extragalactic nova to be observed with the IUE satellite. We have successfully fitted observed ultraviolet and optical spectra of LMC 1988 #1 taken within the first two months of its outburst (when the atmosphere was still optically thick) with synthetic spectra computed using PHOENIX nova model atmospheres. The synthetic spectra reproduce most of the features seen in the spectra and provide V band magnitudes consistent with the observed light curve. The fits are improved by increasing the CNO abundances to 10 times the solar values. The bolometric luminosity of LMC 1988 #1 was approximately constant at 2×10^{38} ergs per second at a distance of 47.3 kpc for the first 2 months of the outburst until the formation of the dust shell.

Author

Atmospheric Models; Novae; Continuous Spectra; Stellar Atmospheres; Andromeda Galaxy

20010079995 Massachusetts Inst. of Tech., Dept. of Physics, Cambridge, MA USA

Search for the Centrifugal Barrier in Transient X-ray Pulsars Final Report, 15 Apr. 1997 - 15 Apr. 2000

Rappaport, Saul, Massachusetts Inst. of Tech., USA; [2000]; 1p; In English

Contract(s)/Grant(s): NAG5-4115; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This paper discusses a search for the centrifugal barrier in transient X-ray pulsars with RXTE. The RXTE observation associated with this research involved monitoring the X-ray intensities and pulse profiles of six transient x-ray pulsars on five different occasions. The goal was to determine whether the so-called "centrifugal barrier" effects exists for accretion-powered X-ray pulsars. In this long-postulated effects, accretion onto the neutron star should be inhibited when the accretion rate falls below the point where the magnetospheric boundary lies outside the neutron star's corotation radius.

Derived from text

X Ray Timing Explorer; Pulsars; Centrifugal Force; X Ray Astronomy; Stellar Mass Accretion; X Ray Binaries

20010081064 NASA Ames Research Center, Moffett Field, CA USA

An Explorer-Class Astrobiology Mission

Sandford, Scott, NASA Ames Research Center, USA; Greene, Thomas, NASA Ames Research Center, USA; Allamandola, Louis, NASA Ames Research Center, USA; Arno, Roger, NASA Ames Research Center, USA; Bregman, Jesse, NASA Ames Research Center, USA; Cox, Sylvia, NASA Ames Research Center, USA; Davis, Paul K., NASA Ames Research Center, USA; Gonzales, Andrew, NASA Ames Research Center, USA; Haas, Michael, NASA Ames Research Center, USA; Hanel, Robert, NASA Ames Research Center, USA; [2000]; 14p; In English; UV, Optical and IR Space Telescopes and Instruments, 26-31 Mar. 2000, Munich, Germany

Contract(s)/Grant(s): RTOP 632-70-04-03; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper we describe a potential new Explorer-class space mission, the AstroBiology Explorer (ABE), consisting of a relatively modest dedicated space observatory having a 50 cm aperture primary mirror which is passively cooled to T less than 65 K, resides in a low-background orbit (heliocentric orbit at 1 AU, Earth drift-away), and is equipped with a suite of three moderate order (m approx. 10) dispersive spectrographs equipped with first-order cross-dispersers in an "echellette" configuration and large format (1024x1024 pixel) near- and mid-IR detector arrays cooled by a modest amount of cryogen. Such a system would be capable of addressing outstanding problems in Astrochemistry and Astrophysics that are particularly relevant to Astrobiology and addressable via astronomical observation. The observational program of this mission would make fundamental scientific progress in each of the key areas of the cosmic history of molecular carbon, the distribution and chemistry of organic compounds in the diffuse and dense interstellar media, and the evolution of ices and organic matter in young planetary systems. ABE could make fundamental progress in all of these areas by conducting an approximately one year mission to obtain a coordinated set of infrared spectroscopic observations over the 2.5-20 micrometers spectral range at spectral resolutions of R greater than or equal to 1000 of approximately 1000 galaxies, stars, planetary nebulae, and young star planetary systems.

Author

Astrophysics; Exobiology; Space Missions; Astronomical Models; Organic Compounds

20010081592 Arizona State Univ., Office of Research and Creative Activities, Tempe, AZ USA

Mineralogy and Microstructures of Shock-Induced Melt Veins in Chondrites Final Report, 1 May 1998 - 30 Apr. 2000

Sharp, Thomas G., Arizona State Univ., USA; [2000]; 13p; In English

Contract(s)/Grant(s): NAG5-7285; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The applicability of phase equilibrium data to the interpretation of shock-induced melt veins can only be tested by a detailed study of melt- vein mineralogy to see how high-pressure assemblages vary as a function of shock conditions inferred from other indicators. We have used transmission electron microscopy (TEM), analytical electron microscopy (AEM), scanning electron microscopy (SEM), electron microprobe analysis (EMA) and optical petrography to characterize the mineralogy, microstructures, and compositions of melt veins and associated high-pressure minerals in shocked chondrites and SNC meteorites. In the processes, we have gained a better understanding of what melt veining can tell us about shock conditions and we have discovered new mineral phases in chondritic and SNC meteorites.

Derived from text

Microstructure; Mineralogy; SNC Meteorites; Veins (Petrology); Shock; Chondrites

20010081814 Arizona State Univ., Dept. of Geological Sciences, Tempe, AZ USA

High-Pressure Phases in Shock-Induced Melt Veins from the Umbarger L6 Chondrite: Constraints on Shock Conditions

Xie, Z., Arizona State Univ., USA; Tomioka, N., Arizona State Univ., USA; Sharp, T. G., Arizona State Univ., USA; [2000]; 2p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Shock-induced melt veins in the Umbarger L6 (S6) chondrite contain a previously unknown set of high-pressure phases consisting of ringwoodite ((Mg, Fe)₂SiO₄), akimotoite ((Mg, Fe)SiO₃-ilmenite), augite ((Ca, Na)(Mg, Fe, Al)(Si, Al)₂O₆), and hollandite-structured plagioclase ((Na, K, Ca)(Al, Si)₄O₈). Crystallization of akimotoite suggests supercooling of the melt vein during adiabatic decompression. High-pressure minerals are common in highly shocked (S6) L6 chondrites. These minerals, which occur within or adjacent to shock-induced melt veins, provide evidence of very high pressure and temperature conditions during impact events. The goal of this study is to characterize the high-pressure mineral assemblages of the melt veins in the L6 chondrite Umbarger to better understand crystallization conditions, and the shock history of meteorite parent body. Mineral assemblages in shock-induced melt veins have been used to estimate crystallization conditions during shock metamorphism, based on phase equilibrium data. Umbarger was previously classified as shock stage S4, based on deformation features not associated with melt veins. Based on previously unrecognized ringwoodite in the melt veins of Umbarger, we classified the shock stage as S6. Further transmission electron microscopy (TEM) study reveals several other high-pressure phases in melt veins that can be used to infer crystallization and shock conditions.

Author

Chondrites; Veins (Petrology); Minerals; Mineral Deposits; Crystallization

20010081815 NASA Ames Research Center, Moffett Field, CA USA

Successful Hybrid Approach to Visual and Video Observations of the 1999 Leonid Storm

Jenniskens, Peter, Search for Extraterrestrial Intelligence Inst., USA; Crawford, Chris, Crawford (Chris), USA; Butow, Steve, Search for Extraterrestrial Intelligence Inst., USA; [2000]; 10p; In English

Contract(s)/Grant(s): RTOP 344-50-92; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A new hybrid technique of visual and video meteor observations is described. The method proved particularly effective for airborne observations of meteor shower activity. Results from the 1999 Leonid Multi-Instrument Aircraft Campaign are presented, and the profile shape of the 1999 Leonid storm is discussed in relation to meteor shower models. We find that the storm is best described with a Lorentz profile. Application to past meteor outbursts shows that the current multi-traillet model of a dust trail is slightly shifted and we crossed deeper into the 1899 epoch traillet than expected.

Author

Visual Observation; Leonid Meteoroids; Dust Storms; Mathematical Models

20010082945 NASA Ames Research Center, Moffett Field, CA USA

From Interstellar PAHs and Ices to the Origin of Life

Allamandola, Louis J., NASA Ames Research Center, USA; [2000]; 1p; In English; NATO School on Solid State Astrochemistry, 5-16 Jun. 2000, Erice, Italy

Contract(s)/Grant(s): RTOP 399-20-61; No Copyright; Avail: Issuing Activity; Abstract Only

Tremendous strides have been made in our understanding of interstellar material over the past twenty years thanks to significant, parallel developments in observational astronomy and laboratory astrophysics. Twenty years ago the composition of interstellar dust was largely guessed at, the concept of ices in dense molecular clouds ignored, and the notion of large, abundant, gas phase, carbon rich molecules widespread throughout the interstellar medium (ISM) considered impossible. Today the composition of dust in the diffuse ISM is reasonably well constrained to micron-sized cold refractory materials comprised of amorphous and crystalline silicates mixed with an amorphous carbonaceous material containing aromatic structural units and short, branched aliphatic chains. In dense molecular clouds, the birthplace of stars and planets, these cold dust particles are coated with mixed molecular ices whose composition is very well constrained. Lastly, the signature of carbon-rich polycyclic aromatic hydrocarbons (PAHs), shockingly large molecules by earlier interstellar chemistry standards, is widespread throughout the Universe. The first part of this lecture will describe how infrared studies of interstellar space, combined with laboratory simulations, have revealed the composition of interstellar ices (the building blocks of comets) and the high abundance and nature of interstellar PAHs. The laboratory database has now enabled us to gain insight into the identities, concentrations, and physical state of many interstellar materials. Within a dense molecular cloud, and especially in the solar nebula during the star and planet formation stage, the materials frozen into interstellar/precometary ices are photoprocessed by ultraviolet light, producing more complex molecules. The remainder of the presentation will focus on the photochemical evolution of these materials and the possible role of these compounds on the early Earth. As these materials are thought to be the building blocks of comets and related to the carbonaceous components of micrometeorites, they are likely to have been important sources of complex organic materials on the early Earth and their composition may be related to the origin of life.

Author

Astrophysics; Biological Evolution; Interstellar Chemistry; Interstellar Matter; Polycyclic Aromatic Hydrocarbons

20010082959 Lunar and Planetary Inst., Houston, TX USA

Nanocrystalline Maskelynite in the Sixiangou and Tenham L-6 Chondrites: Microstructures of Shocked Plagioclase with the Hollandite Structure

Sharp, T. G., Arizona State Univ., USA; ElGoresy, A., Max-Planck-Inst. fuer Chemie, Germany; Chen, M., Guangzhou Inst. of Geography, China; [2000]; 2p; In English; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We have used a transmission electron microscope (TEM) to investigate the hollandite-structured high-pressure polymorph of plagioclase in the L6 chondrites Sixiangou and Tenham.

Author

Chondrites; Microstructure; Metamorphism (Geology); Minerals

91

LUNAR AND PLANETARY SCIENCE AND EXPLORATION

Includes planetology; selenology; meteorites; comets; and manned and unmanned planetary and lunar flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

20010080457 NASA Ames Research Center, Moffett Field, CA USA

Applying Multiagent Simulation to Planetary Surface Operations

Sierhuis, Maarten, Research Inst. for Advanced Computer Science, USA; Sims, Michael H., NASA Ames Research Center, USA; Clancey, William J., NASA Ames Research Center, USA; Lee, Pascal, Search for Extraterrestrial Intelligence Inst., USA; [2000]; 10p; In English; COOP 2000 Workshop on Modeling Human Activity, Unknown; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This paper describes a multiagent modeling and simulation approach for designing cooperative systems. Issues addressed include the use of multiagent modeling and simulation for the design of human and robotic operations, as a theory for human/robot cooperation on planetary surface missions. We describe a design process for cooperative systems centered around the Brahms modeling and simulation environment being developed at NASA Ames.

Author

Planetary Surfaces; Human Reactions; Models; Simulation; Activity (Biology)

20010081197 NASA Johnson Space Center, Houston, TX USA

Eyes on the Red Planet: Human Mars Mission Planning, 1952-1970

Platoff, Annie, NASA Johnson Space Center, USA; July 2001; 116p; In English

Report No.(s): NASA/CR-2001-208928; S-873; NAS 1.26:208928; Copyright; Avail: Issuing Activity

The history of human Mars mission planning from the early 1950s through the 1960s is examined. For centuries, Mars has been an object of fascination and, since the 1800s, science-fiction authors have imagined what it would be like for humans to travel to that planet. Space enthusiasts have shared this dream and as early as the 1950s were presenting feasible proposals for human missions to Mars. Since the creation of NASA, the Agency has maintained the idea of human Mars missions as an important long-term goal. Throughout its history, NASA has conducted studies aimed at landing an astronaut on Mars. NASA's current strategic plan still includes this goal. Therefore, it is important to look at previous planning efforts to see what work has been accomplished and to discover lessons that future planners can apply to their programs.

Author

Mission Planning; Astronauts; Manned Mars Missions

20010081325 NASA Ames Research Center, Moffett Field, CA USA

Communication System Architecture for Planetary Exploration

Braham, Stephen P., Simon Fraser Univ., Canada; Alena, Richard, NASA Ames Research Center, USA; Gilbaugh, Bruce, NASA Ames Research Center, USA; Glass, Brian, NASA Ames Research Center, USA; [2001]; 10p; In English; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Future human missions to Mars will require effective communications supporting exploration activities and scientific field data collection. Constraints on cost, size, weight and power consumption for all communications equipment make optimization of these systems very important. These information and communication systems connect people and systems together into

coherent teams performing the difficult and hazardous tasks inherent in planetary exploration. The communication network supporting vehicle telemetry data, mission operations, and scientific collaboration must have excellent reliability, and flexibility.

Author

Architecture (Computers); Space Exploration; Communication Networks; Telecommunication; Communication Equipment

20010082526 Massachusetts Inst. of Tech., Cambridge, MA USA

Archiving of Planetary Ring Data Final Report, 1 Jul. 1993 - 31 Mar. 2000

Elliot, James L., Massachusetts Inst. of Tech., USA; Aug. 08, 2001; 3p; In English

Contract(s)/Grant(s): NAG2-855; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Stellar occultation data provide our only Earth-based means of probing planetary rings at kilometer spatial resolution. The occultation data archive at MIT contains original data and analysis products of stellar occultations by the ring systems of the planets Jupiter, Saturn, Uranus, and Neptune observed by members of the group (and other groups) from 1977 to the present. During this time period, several media have been used to record and store the original and processed data: (1) chart records; (2) printed output, (3) audio reel tape; (4) audio cassette tape; (5) 7-track, 1/2-inch computer tape; (6) 9-track, 1/2-inch computer tape at 800, 1600, and 6250 bpi; (7) NOVA disk platters (2.5 and 5.0 Mbyte); (8) write once optical disks; (9) punched cards; and (10) read-write optical disks. With the rapid change of computer technology over this time period, some of these media have become not only obsolete, but nearly extinct. In particular, it has become nearly impossible to find any facilities that can still read 800 bpi tapes, which contain the only copies of several important data sets for the ring system of Uranus. In particular, we have an extensive ring data collection that includes data sets for the following Uranian ring occultations: U0, U11, U12, U13, U14, U25, U17, and U36.

Author

Data Acquisition; Planetary Rings; Uranus (Planet)

20010082934 NASA Ames Research Center, Moffett Field, CA USA

ISRU Technologies for Mars Life Support

Finn, John E., NASA Ames Research Center, USA; Sridhar, K. R., Arizona Univ., USA; [2000]; 1p; In English; Concepts and Approaches for the Robotic Exploration of Mars, 18-20 Jul. 2000, Houston, TX, USA

Contract(s)/Grant(s): RTOP 131-20-10; No Copyright; Avail: Issuing Activity; Abstract Only

The primary objectives of the Mars Exploration program are to collect data for planetary science in a quest to answer questions related to Origins, to search for evidence of extinct and extant life, and to expand the human presence in the solar system. The public and political engagement that is critical for support of a Mars exploration program is based on all of these objectives. In order to retain and to build public and political support, it is important for NASA to have an integrated Mars exploration plan, not separate robotic and human plans that exist in parallel or in sequence. The resolution stemming from the current architectural review and prioritization of payloads may be pivotal in determining whether NASA will have such a unified plan and retain public support. There are several potential scientific and technological links between the robotic-only missions that have been flown and planned to date, and the robotic + human missions that will come in the future. Taking advantage of and leveraging those links are central to the idea of a unified Mars exploration plan. One such link is in situ resource utilization (ISRU) as an enabling technology to provide consumables such as fuels, oxygen, sweep and utility gases from the Mars atmosphere. ISRU for propellant production and for generation of life support consumables is a key element of human exploration mission plans because of the tremendous savings that can be realized in terms of launch costs and reduction in overall risk to the mission. The Human Exploration and Development of Space (HEDS) Enterprise has supported ISRU technology development for several years, and is funding the MIP and PROMISE payloads that will serve as the first demonstrations of ISRU technology for Mars. In our discussion and presentation at the workshop, we will highlight how the PROMISE ISRU experiment that has been selected by HEDS for a future Mars flight opportunity can extend and enhance the science experiments on board.

Author

In Situ Resource Utilization; Life Support Systems; Solar System; Mars Exploration

20010082935 NASA Ames Research Center, Moffett Field, CA USA

The Pascal Discovery Mission: A Mars Climate Network Mission

Haberle, Robert M., NASA Ames Research Center, USA; Catling, D. C., Search for Extraterrestrial Intelligence Inst., USA; Chassefiere, E., Centre National de la Recherche Scientifique, France; Forget, F., Centre National de la Recherche Scientifique, France; Hourdin, F., Centre National de la Recherche Scientifique, France; Leovy, C. B., Washington Univ., USA; Magalhaes, J., San Jose State Univ., USA; Mihalov, J., NASA Ames Research Center, USA; Pommereau, J. P., IPSL, France; Murphy, J. R., New Mexico State Univ., USA; [2000]; 1p; In English; Concepts and Approaches for Mars Exploration Workshop, 17-20 Jul. 2000, Houston, TX, USA

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The climate of Mars is a major focus of Mars exploration. With the loss of MCO, however, it remains uncertain how it will be achieved. We argue that a truly dedicated climate mission to Mars should have both orbital and landed components, and that these should operate simultaneously for at least 1 Mars year if not longer. Pascal is Discovery mission that emphasizes the landed component. Its principal goal is to establish a network of 24 small weather stations on the surface of Mars that will operate for 2 Mars years, with an extended mission option for an additional 8 Mars years bringing the total mission lifetime up to 10 Mars years. The stations will collect hourly measurements of pressure, temperature, and optical depth. After delivering the probes to Mars, Pascal's carrier spacecraft will go into an elliptical orbit which will serve as a relay for the landers, and a platform for synoptic imaging. These simultaneous measurements from the surface and from orbit will allow us to characterize the planet's general circulation and its interaction with the dust, water, and CO₂ cycles. During entry, descent, and landing, each of Pascal's 24 probes will also measure the temperature structure of the atmosphere and acquire images of the surface. These data will allow us to determine the global structure of the atmosphere between 15 and 130 km, and characterize the local terrain to help interpret the landed data. The descent images are part of Pascal's outreach program, as the probe camera system will be developed by faculty-supervised student project. The intent is to generate enthusiasm for the Pascal mission by directly involving students. Pascal will be launched on a Delta 11-7925 in August of 2005. A type I trajectory will deliver Pascal to Mars in January of 2006. On approach, the three-axis stabilized carrier spacecraft will spring deploy the Pascal probes in 4 separate salvo's of 6 each. Global coverage is achieved with small time-of-arrival adjustments in between each salvo. Pascal's probes utilize an aeroshell, parachute, and crushable material for entry, descent and landing. On the surface, their long life and global coverage is enabled by a Micro Thermal Power Source with demonstrated heritage. After all probes are released, the carrier spacecraft will execute a small burn for insertion into an elliptical orbit. The long lifetime of the Pascal network was chosen in part to maximize the chances that orbital sounding, like that planned with MCO, would occur at some point during the mission. If Pascal is selected for launch in '05, this could occur if MCO-like science is reflown in the '05 opportunity or, if it is reflown in '03, the mission is extended to overlap with Pascal. The combination of temperature sounding from orbit, and surface pressure mapping from the surface will allow a direct determination of the full 3-D wind field for the first time.

Author

Climate; Mars Missions; Mars Surface; Elliptical Orbits; Planetary Geology

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SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots. For related information see 93 Space Radiation.

20010079649 National Solar Observatory, Tucson, AZ USA

Measurement of Kodaikanal White-Light Images

Howard, Robert F.; 19990101; In English; No Copyright; Avail: Issuing Activity; Abstract Only

Sunspot umbral positions and areas were measured for 82 years (1906-1987) of daily, full-disk photoheliogram observations at the Kodaikanal station of the Indian Institute of Astrophysics. The measurement technique and reduction procedures used were nearly identical to those used earlier for the reduction of Mount Wilson daily full-disk photoheliograms, covering an overlapping interval of 69 years. In this paper we compare the differential rotation of the Sun from the analysis of the Kodaikanal data with the Mount Wilson results. In addition, we analyze the data set formed by combining the data from the two sites for differential rotation. While doing this, it has become apparent to us that small, subtle optical effects at both sites produce systematic errors that have an influence on rotation (and other) results from these data. These optical effects are analyzed here, and corrections are made to the positional data of the sunspots from both sites. A data set containing the combined positional data of sunspots from both sites, corrected for these optical aberrations, has been constructed. Results for both sunspot groups and individual sunspots are presented. It is pointed out that optical aberrations similar to those found in the Kodaikanal data may also exist in the Greenwich photoheliograph data, because these two sets of solar images were made with similar telescopes.

Author

Sunspots; Astrophysics; Solar Terrestrial Interactions; Astronomical Photography; Spectroheliographs; Solar Rotation; Solar Cycles

20010081063 Scripps Institution of Oceanography, La Jolla, CA USA

Quantitative Assessment of the Integrated Response in Global Heat and Moisture Budgets to Changing Solar Irradiance Final Report

White, Warren B., Scripps Institution of Oceanography, USA; Cayan, Daniel R., Scripps Institution of Oceanography, USA; Dettinger, Michael, Scripps Institution of Oceanography, USA; [2001]; 4p; In English

Contract(s)/Grant(s): NAG5-7653; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Earlier, we found time sequences of basin- and global-average upper ocean temperature (that is, diabatic heat storage above the main pycnocline) for 40 years from 1955-1994 and of sea surface temperature for 95 years from 1900-1994 associated with changes in the Sun's radiative forcing on decadal and interdecadal timescales, lagging by 10 deg.- 30 deg. of phase and confined to the upper 60-120 m. Yet, the observed changes in upper ocean temperature (approx. 0.1 K) were approximately twice those expected from the Stefan-Boltzmann black-body radiation law for the Earth's surface, with phase lags (0 deg. to 30 deg. of phase) much shorter than the 90 deg. phase shift expected as well. Moreover, White et al. (1997, 1998) found the Earth's global decadal mode in covarying SST and SLP anomalies phase locked to the decadal signal in the Sun's irradiance. Yet, Allan (2000) found this decadal signal also characterized by patterns similar to those observed on biennial and interannual time scales; that is, the Troposphere Biennial Oscillation (TBO) and the El Nino and the Southern Oscillation (ENSO). This suggested that small changes in the Sun's total irradiance could excite this global decadal mode in the Earth's ocean-atmosphere-terrestrial system similar to those excited internally on biennial and interannual period scales. This is a significant finding, proving that energy budget models (that is, models based on globally-averaged radiation balances) yield unrealistic responses. Thus, the true response must include positive and negative feedbacks in the Earth's ocean-atmosphere-terrestrial system as its internal mode (that is, the natural mode of the system) respond in damped resonance to quasi-periodic decadal changes in the Sun's irradiance. Moreover, these responses are not much different from those occurring internally on biennial and interannual period scales.

Derived from text

Earth Atmosphere; Energy Budgets; Heat Transfer; Irradiance; Moisture; Phase Shift; Solar Radiation

20010082951 Smithsonian Astrophysical Observatory, Cambridge, MA USA

Physics of the Inner Heliosphere 1-10 R(sub s): Plasma Diagnostics and Models *Final Report, 1 Feb. 1997 - 31 Aug. 2001*

Habbal, Shadia R., Smithsonian Astrophysical Observatory, USA; August 2001; 7p; In English

Contract(s)/Grant(s): NAG5-6271; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

While the mechanisms responsible for heating the solar corona and accelerating the fast and slow solar wind streams are still unknown, model computations offer the only means for exploring and predicting the properties of such mechanisms in light of the empirical constraints currently available. During the time covered by this grant, modeling and data analysis efforts were aimed at: 1) the study of the propagation and damping of ion-cyclotron waves in the fast solar wind 2) the exploration of the role of instabilities in the development of temperature anisotropies in the inner corona 3) the coupling of neutral hydrogen and protons in the fast solar wind 4) the morphology of the source region of the solar wind. Summarized are some of the highlights of these studies. Two PhD theses by Xing Li and Lorraine Allen were partially supported by this grant.

Derived from text

Heliosphere; Plasma Diagnostics; Solar Corona; Magnetohydrodynamic Waves; Mathematical Models

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SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth radiation belts. For biological effects of radiation on plants and animals see 52 Aerospace Medicine. For theory see 73 Nuclear Physics.

20010082534 NASA Langley Research Center, Hampton, VA USA

Proton-Nucleus Elastic Cross Sections Using Two-Body In-Medium Scattering Amplitudes

Tripathi, R. K., NASA Langley Research Center, USA; Wilson, John W., NASA Langley Research Center, USA; Cucinotta, Francis A., NASA Johnson Space Center, USA; August 2001; 17p; In English

Contract(s)/Grant(s): RTOP 101-21-23-03

Report No.(s): NASA/TP-2001-211043; L-18089; NAS 1.60:211043; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Recently, a method was developed of extracting nucleon-nucleon (NN) cross sections in the medium directly from experiment. The in-medium NN cross sections form the basic ingredients of several heavy-ion scattering approaches including the coupled-channel approach developed at the Langley Research Center. The ratio of the real to the imaginary part of the two-body scattering amplitude in the medium was investigated. These ratios are used in combination with the in-medium NN cross sections to calculate elastic proton-nucleus cross sections. The agreement is excellent with the available experimental data. These cross sections are needed for the radiation risk assessment of space missions.

Author

Nucleon-Nucleon Interactions; Proton Scattering; Scattering Amplitude

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